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RADIO NEWS

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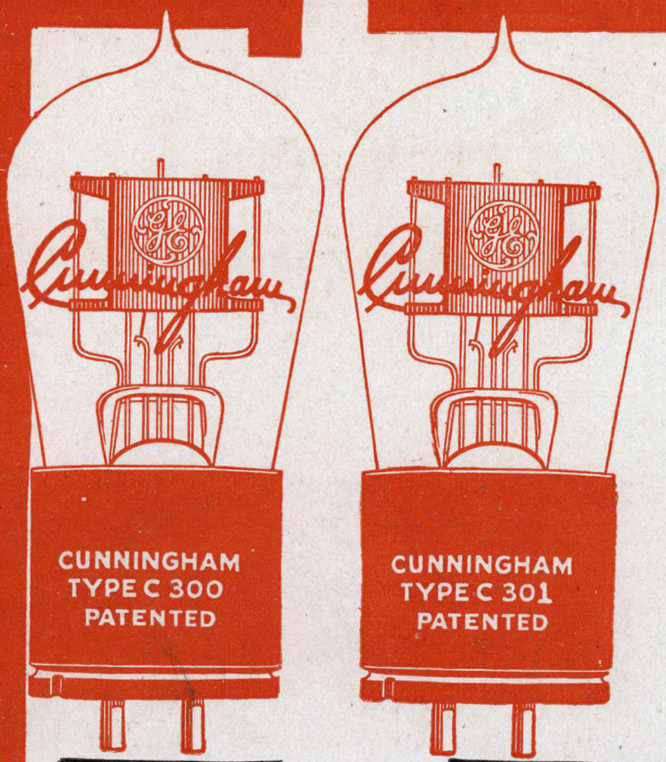
December
1922

Over 175 Illustrations

Edited by H. GERNSBACK

CIRCULATION LARGER THAN ANY OTHER RADIO MAGAZINE



SUPER-SENSITIVE DETECTOR

DISTORTIONLESS AMPLIFIER

Nationally recognized standards for all types of

RADIO RECEIVING SETS

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Amplifies as it Detects

TYPE C-301
HIGH VACUUM AMPLIFIER
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CUNNINGHAM VACUUM TUBES

The trade mark GE is the guarantee of these quality tubes. Each tube is built to most rigid specifications.

PATENT NOTICE
Cunningham tubes are covered by patents dated 11-7-05, 1-15-07, 2-18-08 and others issued and pending. Licensed only for amateur or experimental uses in radio communication. Any other use will be an infringement.

Written indelibly in the annals of radio progress is the record of Cunningham service in placing before the public, vacuum tubes of the highest conceivable standard.

The rapid expansion of radio telephony, now one of the world's foremost utilities, was made possible by the wonderful development of the vacuum tube.

The CUNNINGHAM SUPER-SENSITIVE DETECTOR and DISTORTIONLESS AMPLIFIER TUBES, designed and built in the great laboratories of the General Electric Company, are now nationally recognized as standards for all types of receiving sets.

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Low in Cost
Simple to manipulate

Opened like a book

Carried like a satchel

THE radio enthusiast who lives within ten to twenty miles of a broadcasting station has exactly what he wants in Radiola I (ER 753-A)—low cost, compactness, portability, and simplicity of manipulation.

Open the walnut cabinet, and on the front panel you find the tuning control, the crystal detector and the binding posts. In the body of the cabinet are the head-telephones. Tuck away the telephones, close the front panel, and you can carry the whole set as you would a satchel.

Radiola I, at your dealer's, $25.00

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This symbol of quality is your protection.

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For 35 cents you can obtain from your dealer or from us a copy of the book "Radio Enters the Home." It explains the principles, the fascination of radio in plain English. It describes Radiolas and their accessories. It contains the most valuable wiring diagrams ever published.

Radio Corporation of America

WORLD WIDE WIRELESS

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Chicago, Ill.

RADIO NEWS

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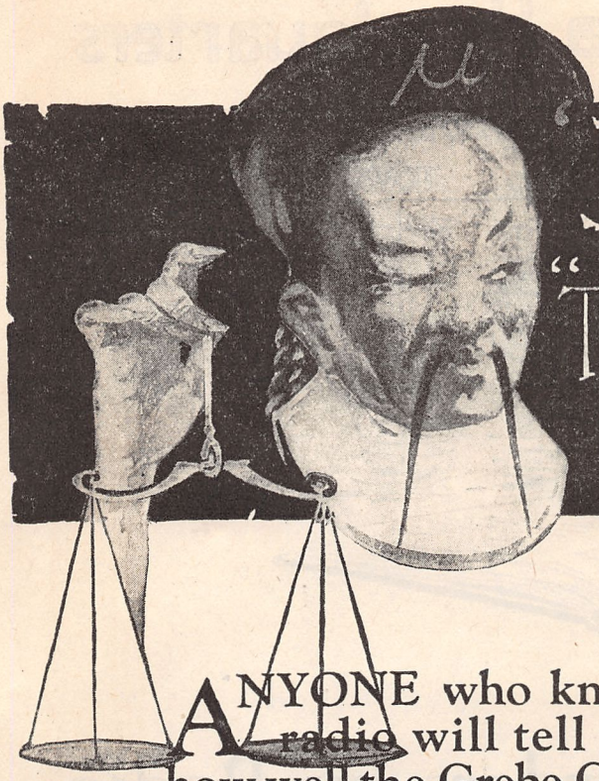

"Just scales and full measure,
injure no man."
"The full measure of service
goes with every Grebe Receiver"

Doctor Why.

ANYONE who knows radio will tell you how well the Grebe CR-5 performs on the daily concerts, lectures, etc., in the air.

Two simple tuning adjustments are used. Tiresome adjustments, unpleasant interruptions are unnecessary with the Grebe CR-5. Its range, 150—3000 metres.

Ten years experience in satisfying a critical radio public has taught us how to build it for your year-round enjoyment.

If your Dealer does not sell Grebe Radio Apparatus, send us his name and receive interesting circular.

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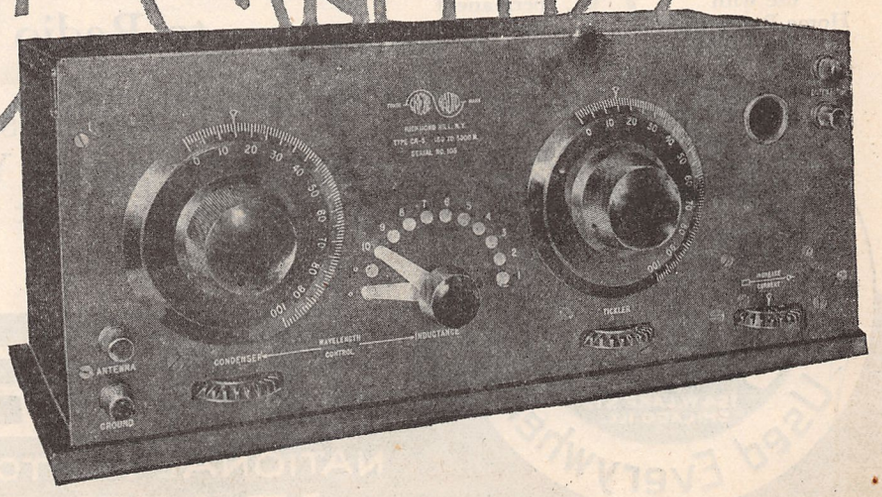

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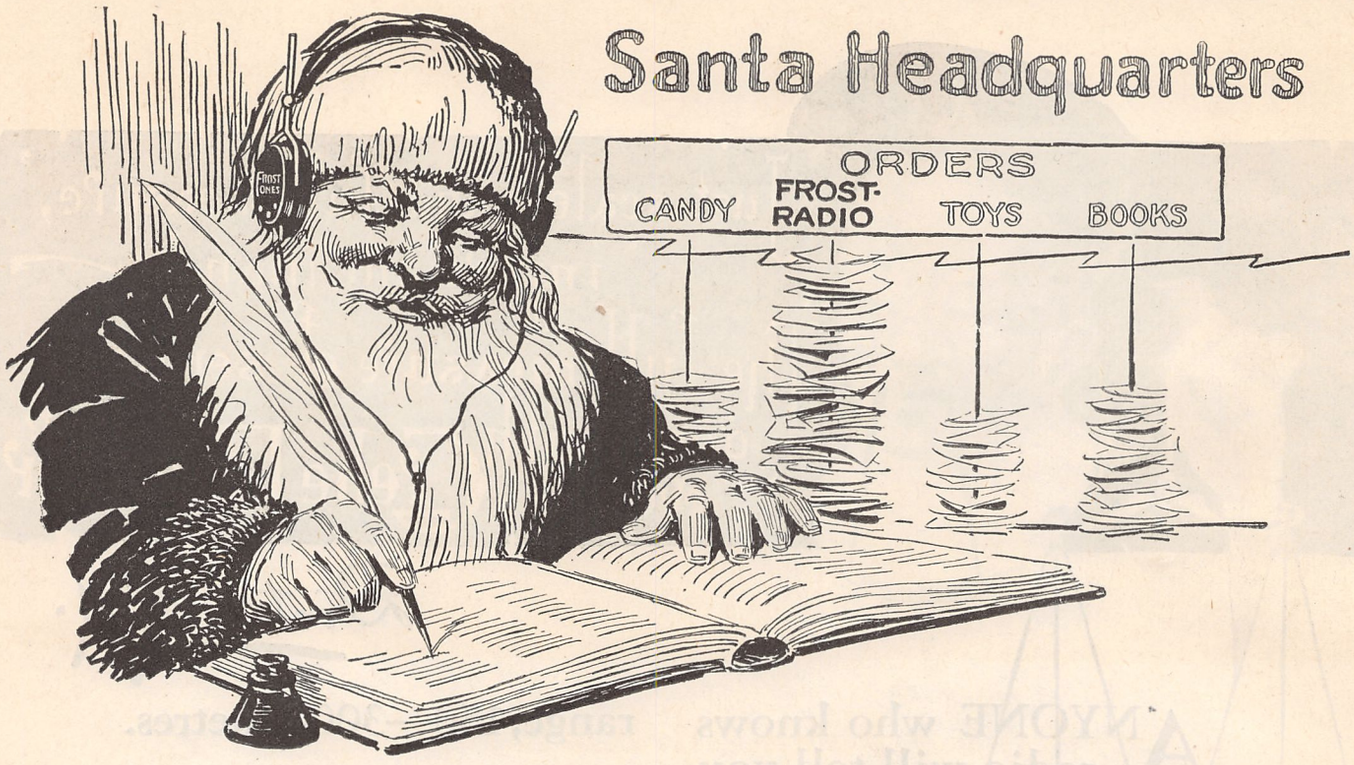

Santa's Taking His Orders by Radio This Year—And They Are Demanding

FROST-RADIO

A Quality Achievement.

Ideal Receivers for use with Home Radio Sets.

Combined maximum efficiency with permanent sensitiveness.

These Radio accessories are the big hit of the season. They win the whole-hearted approval of every Radio "fan." The reason is simply that every item is built to perform best the particular function for which it is intended—priced to satisfying trade-holding levels and quality unsurpassed.

FROST-RADIO Is the Front Door Key to Radio Satisfaction!

In the following six pages we show some **Frost-Radio** leaders. Your local dealer or jobber can supply you. Get in touch with him today.

Like Postage Stamps Used Everywhere

FROST RADIO

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HERBERT

NATIONAL FACTORY DISTRIBUTORS

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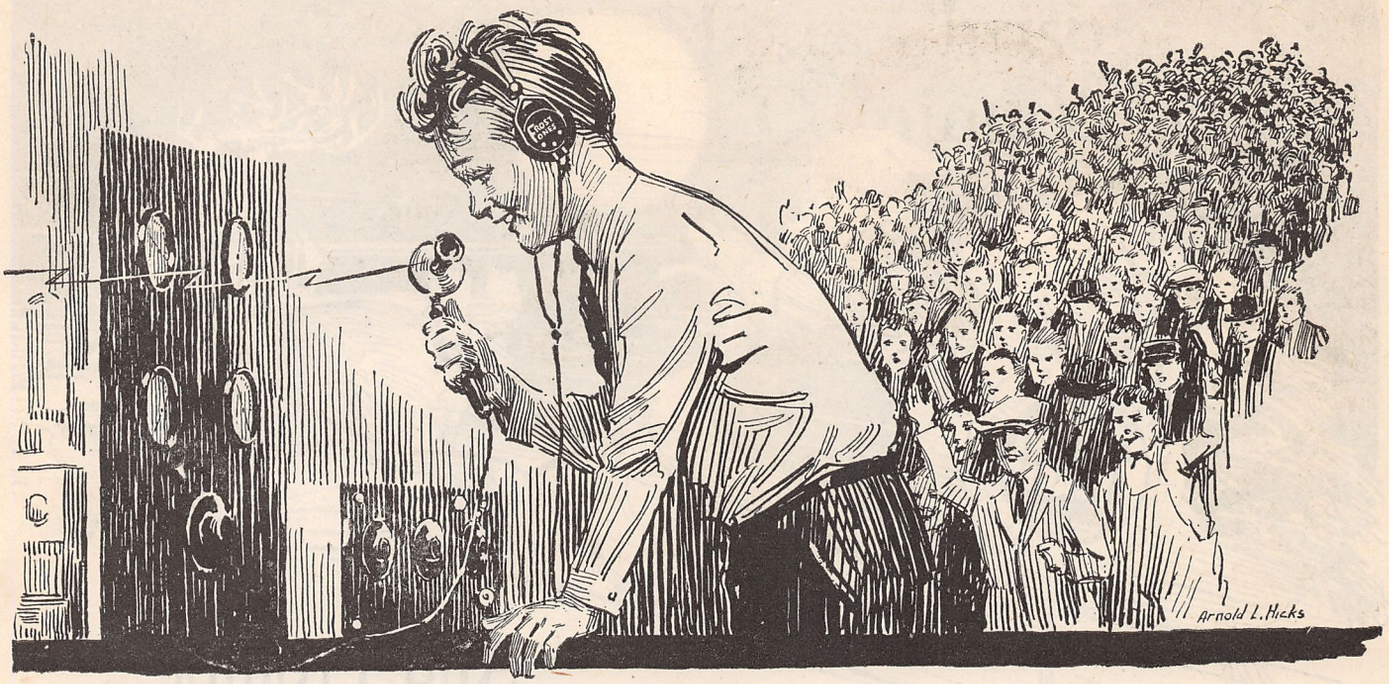
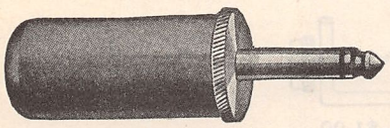


—And a Flock of Radio "Bugs" Step Up to Broadcast Their Christmas Orders!

Three million eager American boys know that this year Santa won't have any excuse for mistaking their orders on account of poor writing. Billie, last year got a Doll and he wrote for a Ball! Santa's **Frost-Fones** are a guarantee of clear accurate Radio reception. They will bring satisfaction to thousands of homes through their dependable service.

A New Plug for 60c

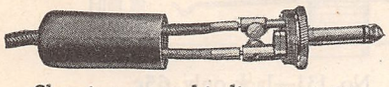


No. 139—All Terminal Plug—60c

Arrived In Time for Xmas!

The new member of the *Frost-Radio* family

This plug (shown above) will be the talk of the Radio field. Priced within reach of every purse. A handsome, highly finished, strong, light weight plug with conductive parts of machined brass. Handle is one piece, turned from solid ins. rod. Screw binding post terminals take cord-tips and terminals of all types. Adjustable brass thumb screws connect wire to plug and insure positive contact. No tools needed. Unnecessary to cut telephone tips. Not affected by body capacity and fits any standard jack.

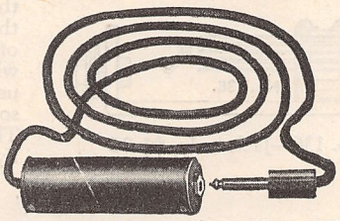


Showing screw binding post terminals with phone cord tips inserted.

FROST-RADIO PLUGS

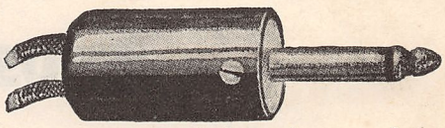
Small, neat and perfectly finished. Specially designed for Radio Panel Work. Interchangeable with other standard makes.

Frost-Radio Extension Cord and Plug



Comes in lengths from 10 to 100 feet. Loud speaker can be placed anywhere and connected with Radio set with Frost-Radio Extension Cord.

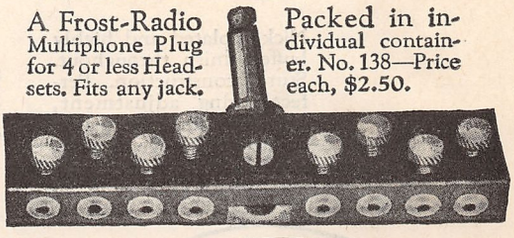
The Better You Know the Magic of Radio, the Better You Will Appreciate *Frost-Radio* Accessories!



New type of plug taking cord tips directly. Not necessary to remove tips. Handsomely finished. Polished hard rubber sleeve covers tips and is held firmly by tightening one screw. Nothing to come loose. Cord Tip Plug No. 137—Each, $1.25.

A Frost-Radio Multiphone Plug for 4 or less Headsets. Fits any jack.

Packed in individual container. No. 138—Price each, $2.50.



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FROST RADIO

154 W. LAKE ST. CHICAGO, ILL.

H. FROST

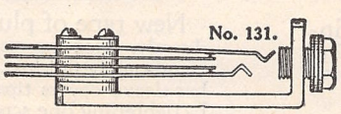
TO THE ELECTRICAL-RADIO JOBBER

CHICAGO, ILL. U.S.A.

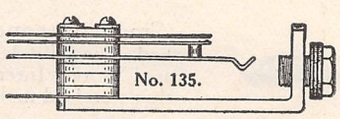
—And Prompt Deliveries Add a Link to the FROST-RADIO Chain of Satisfaction

Deliveries of **Frost-Radio** Christmas merchandise will exceed any previous record for speed and volume. We will bend every effort to eliminate delays, shortages and retain the good-will of our customers. We are organized this year to assure our Electrical-Radio Jobbers "at once" deliveries on every item in our entire line.

FROST-RADIO JACKS

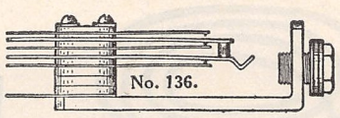


No. 131—Jack only, 90c

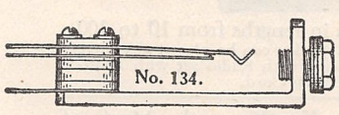


No. 135—Jack only, $1.00

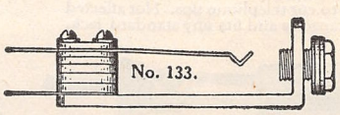
Nickel plated and highly buffed finish throughout. Sturdy construction. Perfect spring adjustment, gripping contact of springs on tip and sleeve of plug. A particularly desirable and exclusive feature of the **Frost-Radio** Jack is the "spread" arrangement of the spring terminals which allows twice the usual amount of space for soldering to the wiring. These terminals are heavily tinned.



No. 136—Jack only, $1.25



No. 134—Jack only, 75c



No. 133—Jack only, 65c

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Used Everywhere

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NATIONAL FACTORY DISTRIBUTORS

154 W. LAKE ST.

—And FROST-RADIO Makes Christmas Joy Last Thruout the Coming Year!

The faithful service of **Frost-Radio** apparatus can be relied upon every day—in all seasons—and in every condition of weather. There's genuine satisfaction in these better Radio accessories.

It Is Not So Much What You Pay— But What Comes With Your Order

When you buy **Frost-Radio** you are sure of getting Radio merchandise that has proven itself above the ordinary. The value of the **Frost-Radio** trademark is the service record of the apparatus behind it.

Frost-Radio Slide Tuner

An article which we are just introducing to the market. It is so good you can take personal pride in recommending it to your customers. **Flexible Range—Mahogany Woodwork.** List price, **$3.00.**

Frost-Radio Receiving Transformer

Every inch a quality piece of Radio merchandise. Finish, hand-rubbed mahogany. Range, 200 to 3500 meters. Brass metal parts are nickeled and highly buffed. Secondary inductance has 12 point switch mounted on Bakelite coil head. Wound with green silk covered wire. List price, **$8.50.**

CUNNINGHAM VACUUM TUBES

FOR HOME RADIO RECEIVING SETS

Amplifies as it Detects. Nationally recognized as the Ideal Vacuum Tubes. Insure clearest reception of all radio messages, concerts, press and weather reports.

Type C300 Gas Content Detector - **$5.00**
Type C301 High Vacuum Amplifier, **$6.50**

H. FROST

TO THE ELECTRICAL-RADIO JOBBER
CHICAGO, ILL. U.S.A.

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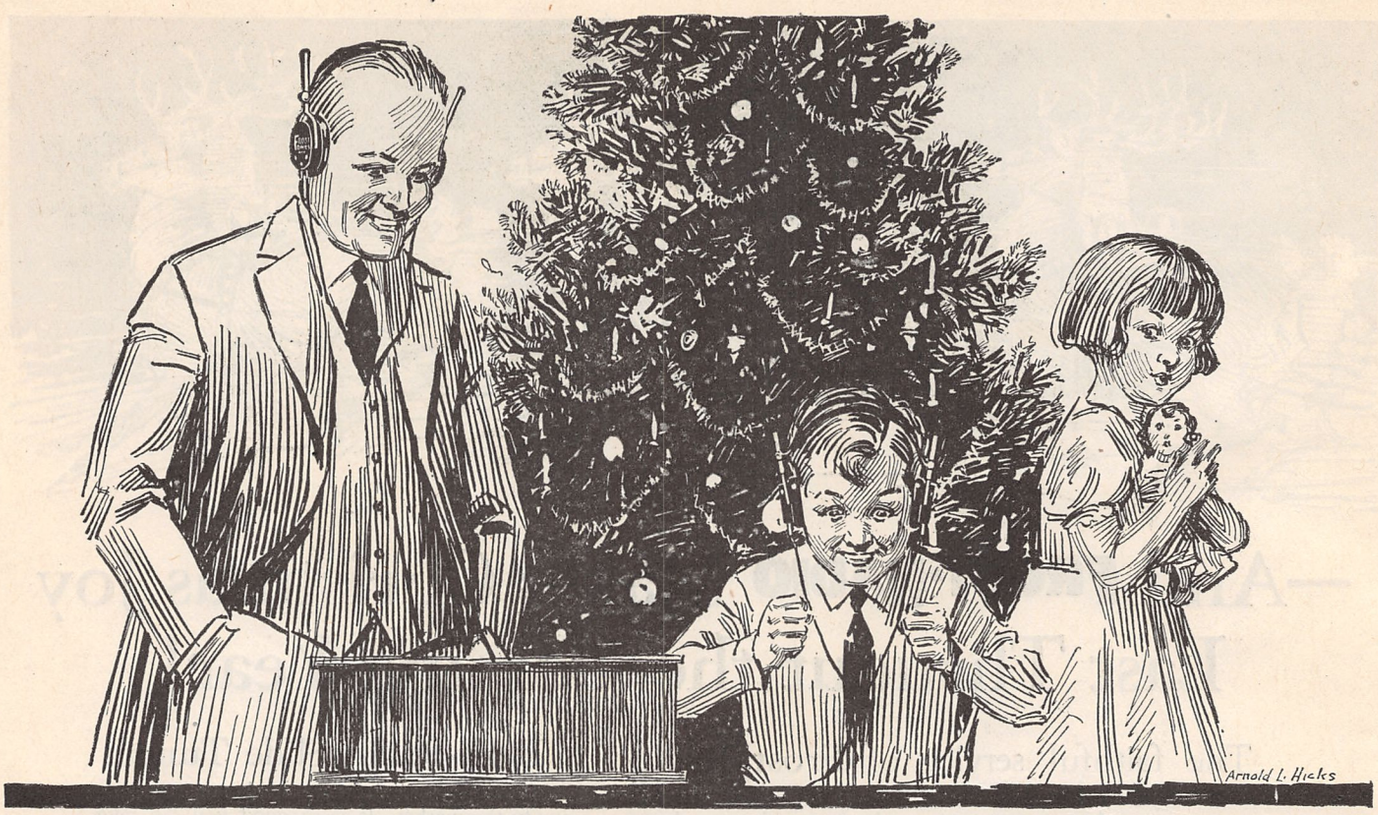
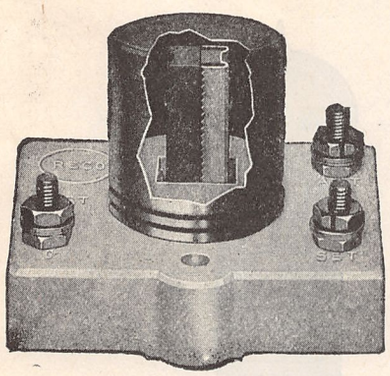


—And FROST-RADIO Begins the Christmas Fun!

Dad, altho a recent convert to the mysteries of Radio, knows good entertainment. **Frost Fones** bring in good entertainment with a clarity of tone and accuracy of reproduction which satisfies the most critical. Billie is so chuck full of plum pudding and excitement, that he has left his other toys unopened. Little Mary looks on with eyes of envy and expectation. **Frost-Radio** makes the Merry Christmas twice as merry. As Billie says, "Gee, Dad! It's plain as if they were in the room here!"



FROST-RADIO is good news broadcasted to scores of discriminating buyers.

FROST-RADIO Lightning Protector

Listed by Underwriters' Laboratories under April, 1922, regulations. No interference with clear Radio receiving. Never grounds. Mounts indoors. Price $1.50. Good deliveries on this approved device.

Like Postage Stamps — FROST RADIO — 154 W. LAKE ST. CHICAGO, ILL. — Used Everywhere

HERBERT

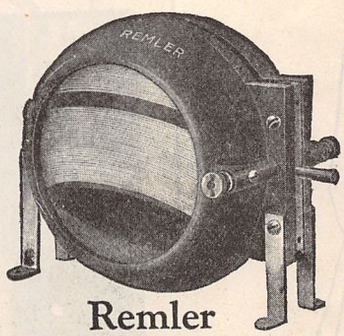
NATIONAL FACTORY DISTRIBUTORS

154 W. LAKE ST.

—And We Wish You a Merry FROST-RADIO Christmas!

Jobbers, Dealers and Radio retail buyers: We thank you for the support which you have rendered us in putting **Frost-Radio** on the Radio map as a quality line that is just right, in materials, workmanship and finish. It is our hope that the satisfaction in being associated with this line will be amplified to a greater degree as time advances.

Herbert Frost



Remler Radio Apparatus

Radiates quality. Every Remler item is first studied and tested for its practical Radio utility before being marketed.

Exclusive features of the Remler line guarantee service and satisfaction for users; profit and prestige for dealers.

Like Postage Stamps — FROST RADIO — 154 W. LAKE ST. CHICAGO, ILL. — Used Everywhere

H. FROST

TO THE ELECTRICAL-RADIO JOBBER

CHICAGO, ILL. U.S.A.

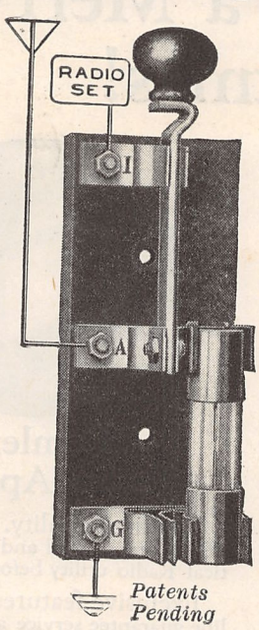
Make it a Radio Christmas

THERE will be no class of gifts more popular this season than those which aid the Radio "fan" in getting the best results. These two pages are full of suggestions that will make radio set owners happy. First in interest comes the Barkelew Lightning Arrester Switch. It furnishes continuous Vacuum Tube Arrester protection with a positive ground when desired. It is the latest word in lightning protection of Antenna circuits and should be on every aerial. It fully protects your set and your home.

The Barkelew Four-Phone Plug is a convenience that adds much to the enjoyment of a radio set. It enables the whole family to "listen-in."

Barkelew Lightning Arrester Switch

For Receiving Stations



Patents Pending

This is the switch that gives double protection. It combines all the merits of a Vacuum Tube Arrester with those of a perfect ground switch.

The Two on One Base

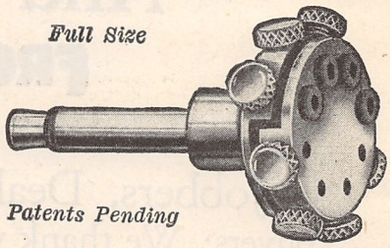
Approved by the Underwriters' Laboratories.

Buy this for yourself and make some radio friend happy by a gift of one. Ask your dealer to reserve one now.

Cat. No. 602 .....Price $3.50

Barkelew Four-Phone Plug

Full Size



Patents Pending

With this Four-Phone Plug you can use four phones or less on any set employing a telephone jack.

Ample room; phones easily adjusted without removing plug. Order now to insure having it by Christmas.

Cat. No. 614 .....Price $1.50

Barkelew Products had established a reputation for quality long before Radio became a commercial possibility. In the manufacture of Electrical Switches we have earned our spurs. We zealously guard our prestige and our Radio parts and specialties are of a quality in keeping with our record.

BARKELEW

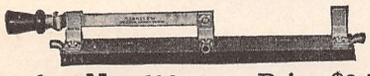
Barkelew Will Help Do It

No owner of a radio set can afford to be without the protective devices shown on these two pages. They improve reception and give a finished appearance to any well built installation.

Antenna Ground Switches

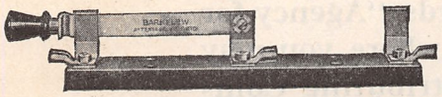
For Transmitting Stations

(Approved and listed by the Underwriters' Laboratories.)



Catalog No. 600 .....Price $2.50

The switch for ordinary home usage. Low priced and compact. Fully in accord with requirements of National Electric Code.
Lgt., 17", Wdt., 1¾", Dpt., 2¼".

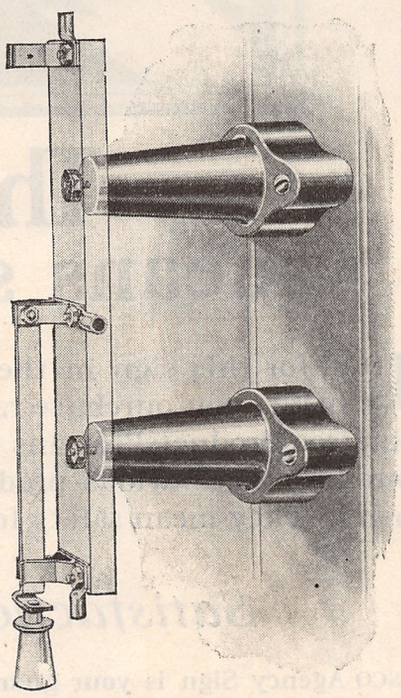


Catalog No. 601 .....Price $3.15

A heavy, sturdy switch designed for use in schools, public buildings and commercial stations. Far exceeds requirements laid down by National Electric Code.
Lgt., 18", Wdt., 2¼", Dpt., 2½".

Porcelain Pedestals

(Brown Glaze)



These pedestals are specially designed to meet the 5" separation between switch and wall, a requirement of The National Electric Code.

They are designed for use with our switches No. 600, No. 601 and No. 602 but may be used for spacing any piece of apparatus out from the building. Ask your dealer.

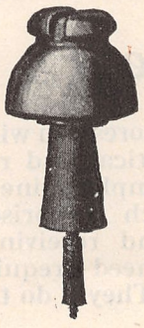
Cat. No. 611, Price per pair $0.50

Radio "Lead-in" Insulators

Insure Ample and Proper Insulation.

This type for Receiving Station outside wiring.

Cat. Number 612.
Price $0.50



This large, petticoat insulator for Transmitting Station.

Cat. Number 613.
Price $1.00

To Radio Distributors and Dealers

Trade discounts to Radio Distributors and Dealers who have established standing or can prove their status.

Write for our new Window Display Cards featuring our Four-Phone Plug. Bulletins, No. 27, No. 28, No. 29 and No. 30, showing all of the above apparatus will be furnished on request.

Local distribution is through Dealers wherever available. If your dealer does not sell them we will give you the name of one who will. Write to our nearest office.

The Barkelew Electric Mfg. Co.

MIDDLETOWN, OHIO

15 S. Clinton St., Chicago
75 Fremont St., San Francisco
603 Century Bldg., Pittsburgh
1487 Broadway, New York

This sign means safety for you

LOOK for this sign in the Radio or electrical dealer's windows before you purchase radio supplies. The words "Agency for Radisco Products" means far more than a place where you may purchase the various products of the Radio Distributing Company. They mean safety for you.

Satisfaction or money back

THE RADISCO Agency Sign is your guarantee that the products sold within will positively do what they are intended to do. No if's or and's. Should a Radisco Radio Product prove defective in material or workmanship the Radisco dealer will replace it with a new Radisco Part or he will return your money. You are guaranteed satisfaction or money back.

Reliable advice

EVERY ONE of the hundreds of Radisco Agents can be depended upon for responsible, perfectly reliable advice on radio. They know their business. They would not be Radisco dealers if they had not measured up to the Radisco Standard.

IN THEIR stores you will find everything that is good, practical and reliable in radio. They carry a complete line of Radisco Radio Products which comprise everything in transmitting and receiving apparatus that the amateur need require. Just name your purpose. They'll do the rest.

RADISCO RADIO PRODUCTS

"Guaranteed Radio For Every Purpose"

Price Reductions

IN LINE with the RADISCO dealers' policy of selling the very best apparatus at the lowest possible prices, we are glad to inform you that at your RADISCO dealer you will find these products listed at the reduced prices.

FOR YOUR guidance, we are listing certain articles which, although not reduced in price, represent unusual value. Your RADISCO dealer will be glad to show you these and other Guaranteed RADISCO products.

	Reduced from
Murdock No. 56, 3,000 ohm phones	$6.00 to $5.00
Western Electric Phones	15.00 to 12.00
Radisco Variocoupler, complete	6.50 to 5.00
Radisco Variocoupler, without base	5.50 to 4.25
Radisco Variometer	6.00 to 5.00
Radisco Knocked-down Detector	.75 to .60
Corwin Standard 3" Dial, 3/16" and 1/4" shaft	1.00 to .75
Corwin Etched Dial	.75 to .60
Corwin Switches, cut	15% to 20%
Spaghetti, all types reduced	10% to 50%
Radisco Grid and Phone Condensers	.35 to .25
Radisco Grid Condenser and Leak	.50 to .30
Mounted Galena, Grade A	.40 to .30
Mounted Galena, Grade B	.35 to .25

Binding Posts and Contact Points, all types cut from 25% to 50% to meet the most severe competition.

Radisco Duplex Adapter for all phonographs including Edison	$2.50
Radisco Phonoscope (for 4 people)	5.00
Radisco Indoor type lightning Arrester	2.50
Radisco Outdoor type lightning Arrester	3.00
Aeriola Sr. dry cell Receiver	65.00
Aeriola Sr. two-stage dry cell amplifier with tubes	68.00
Murdock Condensers and Accessories	Former prices
Acme Radio Frequency Transformer	5.00
Radisco "B" batteries, guaranteed unreservedly, 22½ volt, large size	3.00
Cutler-Hammer Rheostat	1.00
Kennedy apparatus	Former prices
Clapp-Estham apparatus	Former prices
Frost Apparatus	Former prices
Stramcy Lily Horn	.95
Stramcy Coupler	.60
Radisco Two-Slide Tuning Coil	4.00

Mail this coupon now

MAIL this coupon for a copy of the Radisco Catalog (which lists all that you need to buy for the most complete type of radio set). Just leaf through its pages, pick out the set (or parts) you desire and go to your Radisco dealer. If you do not find a Radisco dealer in your own town, write us. Remember you get satisfaction or money back. Just fill out the coupon.

NOTE.—Dealers who believe they are qualified to become Radisco Agents will be given prompt, courteous attention. State in your letter the reasons why you believe you can uphold the Radisco Standards.

THE RADIO DISTRIBUTING CO.
Newark, N. J., U. S. A.

Gentlemen:
Send me free of charge a copy of the Radisco Catalog of Radio Products.

Name .....
Street .....
City .....
Dealer's Name .....

RADISCO

"Guaranteed Radio For Every Purpose"

'RED-

A Triumph in

— here's what one user has to say of "Red-Heads"

The Newman Stern Company
Cleveland, Ohio

Dear Sirs:

I have a pair of your "Red-Head" receivers purchased about three years ago.

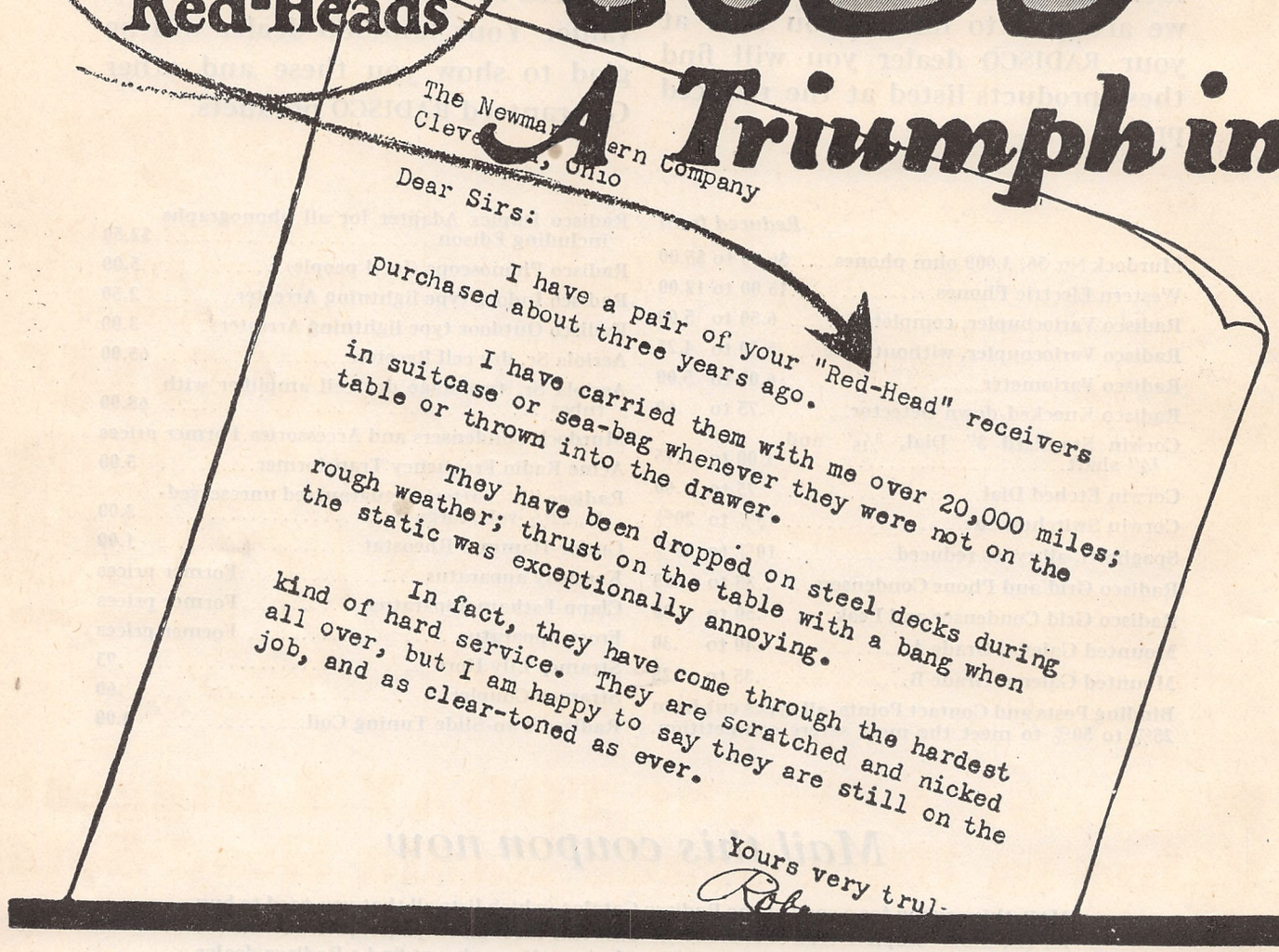
I have carried them with me over 20,000 miles; in suitcase or sea-bag whenever they were not on the table or thrown into the drawer.

They have been dropped on steel decks during rough weather; thrust on the table with a bang when the static was exceptionally annoying.

In fact, they have come through the hardest kind of hard service. They are scratched and nicked all over, but I am happy to say they are still on the job, and as clear-toned as ever.

Yours very trul-

Rob



"As clear-toned as ever"

THAT is the real test of radio telephone receiver quality. As you see from the above typical letter, "Red-Heads" have met the critical needs of the radio fraternity. They have given supreme satisfaction in sensitiveness, clarity of tone, volume, mechanical perfection and durability. They have "made good" in the fullest sense of the word. The best proof that they have made good is the fact that increasing thousands of sets of "Red-Heads" are sold every year.

A New Accomplishment

"Red-Heads" have been on the market for over seven years. These pioneer head-sets have sold for as high as $12.50. Year after year they have undergone revision and improvement to keep them right up to the last refinement in 'phone efficiency and 'phone sensitiveness. The great popularity of "Red-Heads" has enabled us to apply large-scale and economical manufacturing processes to this quality product. So we've actually bettered the phones at the same time that we've lowered the price. Quantity production means savings. These savings are expressed to you in the new, record-low price of $6.50. Just note the specifications that follow and see what a big value you're getting in "Red-Heads" today.

HEADS'

Radio Receiver Design

3000 ohms complete with cord and military head-band

NOW $6.50

Without A Doubt TODAY'S Biggest Value In High-Grade Radio Head-Sets

Specifications
(Compare them with others)

Each "Red-Head" Receiver is wound to 1500 ohms (3000 ohms per pair) with No. 42 highest quality electrolytic copper wire on ground pole pieces attached to the best magnet steel obtainable. The number of ampere turns and magnetic circuit have been carefully worked out according to the best standards of Radio Engineering. Super-sensitive diaphragm. Machine-finished aluminum backs with strain posts and nickeled binding posts. Ear caps of scientific design molded from our special red-brown composition, comfortably fitting the ear. Fully adjustable military type, high quality, headband. Green mercerised cord. Clean cut accurate workmanship and distinctive appearance. *Fully guaranteed.*

The Newman-Stern Co

The Newman-Stern Bldg., Cleveland, O.

You take no risk when you buy "Red-Heads"

Go to your dealers today. Examine "Red-Heads"—or send to us using the coupon below. Bear in mind that if "Red-Heads" are not everything that good radio telephone receivers should be, your money will be cheerfully refunded. We stand back of "Red-Heads" to the very limit. That means when you buy these guaranteed 'phones you are taking no risk.

"There's music in the air"

You can only enjoy it to the highest degree with the right receivers. "Give your ears a treat" with "Red-Heads".

Send the coupon today.

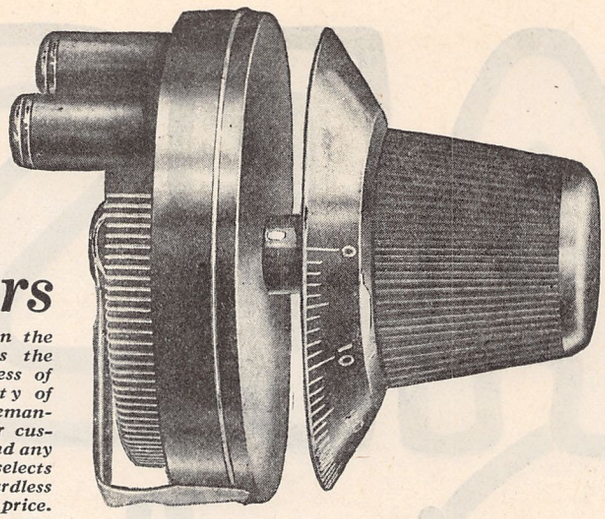
The Newman-Stern Co.
Cleveland, Ohio

Gentlemen:—
Enclosed is Money Order for $6.50 for which please send me a pair of "Red-Head Receivers. It is understood that if I am not completely satisfied with these 'phones, I may return them within seven days and get my money back.

Name_____

Post Office Address_____

The name of my dealer is_____



Dealers

No instruments on the market surpass the Klosner in neatness of design or quality of material and workmanship. Show your customer a Klosner and any other kind—he selects the Klosner regardless of any difference in price. Order through your jobber.

Model 200

$1.80

This Rheostat can tune out ALL INTERFERENCE!

Gives Better Control of Detector Tubes

Best Results Demand Rheostats WITH A VERNIER

MANY RADIO FANS do not realize that one of the main causes of interfering noises and weak reception of signals or music is the LACK of CONTROL of their detector tubes.

You can re-design and re-build your set as much as you please, but until you get MORE ACCURATE CONTROL of your filament current you will never get the full joy of hearing code or concerts coming loud and clear.

No ordinary rheostat can give you the necessary fine adjustment you need. Only a rheostat with a micrometer adjustment — a VERNIER — can give you the results you are after.

The Klosner Vernier Rheostat is so sensitive that you can easily tune out practically all outside interfering noises. And it operates with ONE knob—both coarse and fine adjustments. You turn EXACTLY to the spot you want for clearest results.

Best of all, the Klosner is wire-wound and is equipped with a DIAL. This last is very important, as you can see where it is set—you don't have to feel your way blindly.

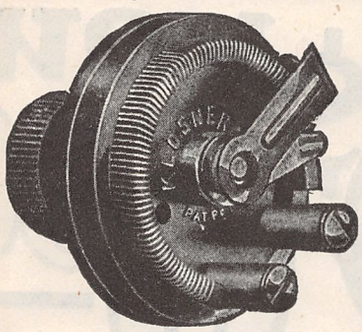
Made of moulded condensite, white letters on black, phosphor-bronze contacts. Absolutely high-class in every respect. **Price, $1.80**

SPECIAL NOTE: With the Armstrong Super-Regenerative Set, the Klosner is especially effective in eliminating TUBE HOWL and other annoying interferences.

"Received your new rheostat a couple of days ago and put it into use. After two days' receiving I am convinced that you have the best rheostat on the market. It makes tube adjustment easier and very much better."

"Just received the two vernier rheostats, and I think they are a valuable asset to any control panel."

"Have received the rheostat and find it a fine piece of apparatus. Please send by parcel post, insured, seven additional rheostats."

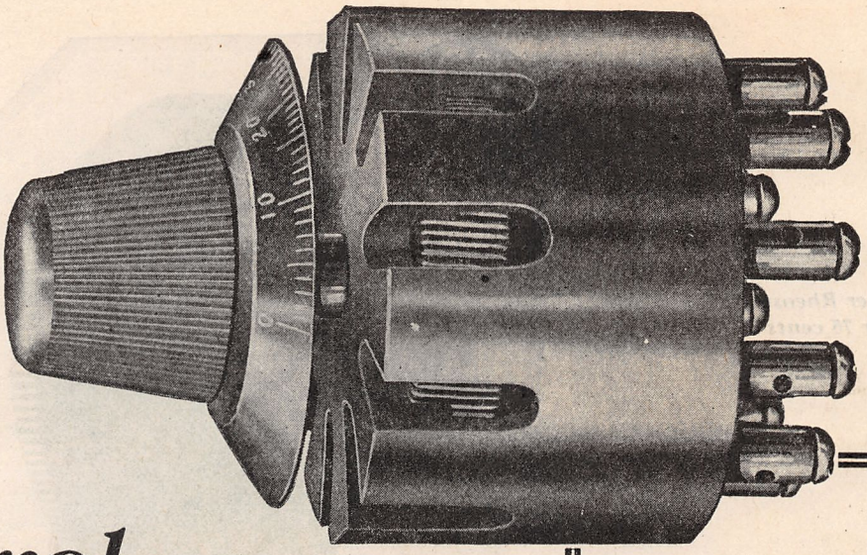


Original Klosner Model 100

THIS is the original model, thousands of which are in use. Has a pointer instead of a dial. Miles ahead of all others (except Model 200). Greatly improved but still selling at retail for

$1.50

KLOSNER



Something Brand NEW! The Amplitrol

Eliminates plugs, jacks and rotary cam switches. Turning ONE knob controls both plate and filament circuits. Makes tubes last longer.

THE AMPLITROL is a better, more convenient method of controlling your amplifying tubes. Does away with all plugs and jacks and rotary-cam switches.

Turning the one single knob not only brings the filament current to the exact strength for maximum clearness but it also switches on the plate circuit in the proper manner. You turn on or off any stage of amplification at will. Your phones or loud speaker remain permanently attached to the binding-posts.

With the Amplitrol, it is impossible to throw a heavy current suddenly on the delicate filament. You turn current into your tubes GRADUALLY. This makes them give at least a third longer service.

Saves the space on the panel and makes a much neater appearance. The one method of amplifying tube control without a drawback.

All dealers have Amplitrols or can get them for you. Retail price, complete with wiring diagram and installing instructions, $4.00 which is only a little more than the cost of the plugs and jacks and switches they eliminate.

Klosner Rheostats and Amplitrols match in appearance—an ideal combination for any panel. Get them both and improve your set.

KLOSNER IMPROVED APPARATUS CO.
Originators and Sole Manufacturers
2024 BOSTON ROAD, NEW YORK CITY

FROM a tool-designer and mechanical engineer—

"I congratulate you, firstly on your remarkable Vernier Rheostat and secondly on the Amplitrol.

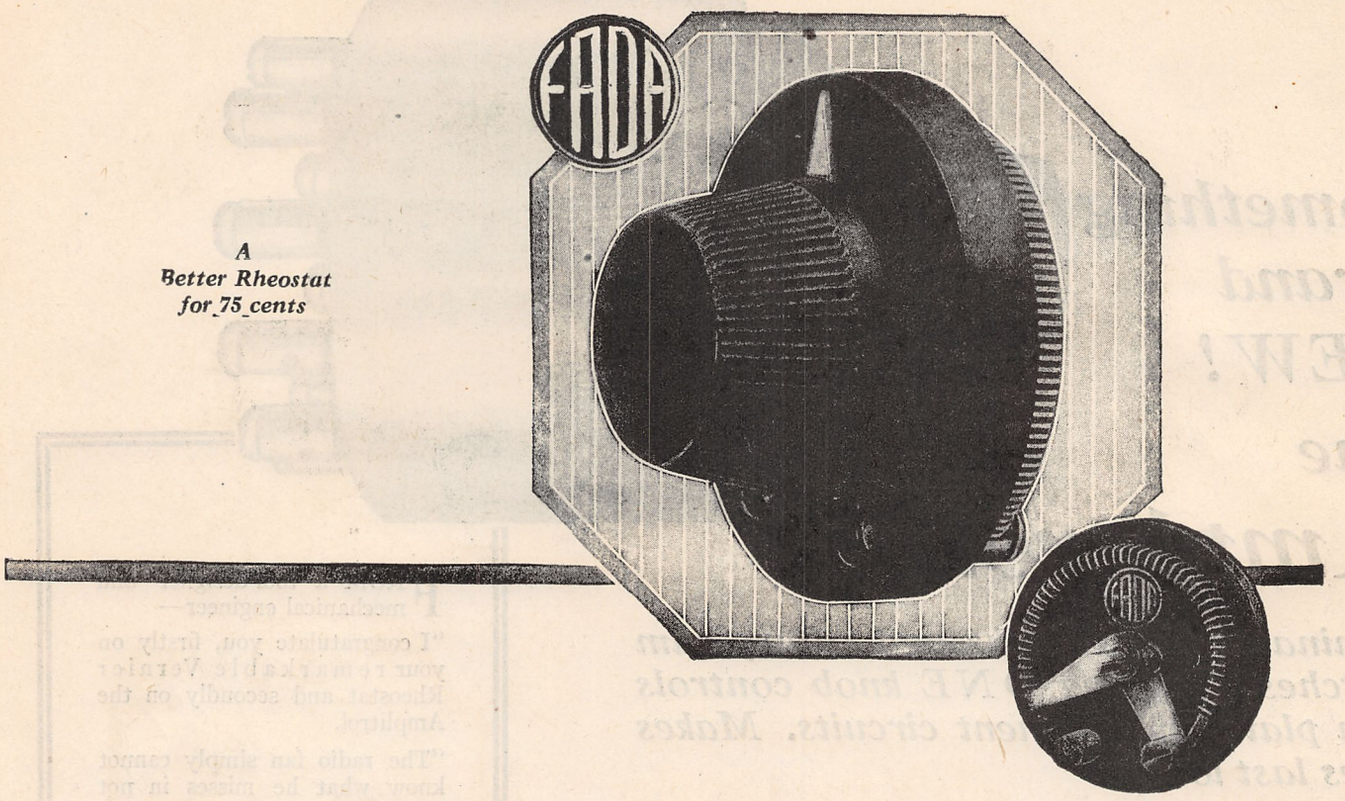
"The radio fan simply cannot know what he misses in not having the micrometer adjustment of his tubes that the Klosner Vernier Rheostat will give him.

"As for the Amplitrol, no enthusiast will clutter up his panel with plugs, jacks and switches, once he sees this new radio instrument."

BOTH Klosner Radio Instruments have blazed a new trail in the industry. There was nothing like them on the market until we offered them to the public. Designed by radio and mechanical engineers with years of experience, they are, of course, wire wound like all other true electrical instruments—also they are equipped with a DIAL so that the operator can know just what he has at any time.

KLOSNER

A Better Rheostat for 75 cents



Half Million "Radio Fans" Bought Fada Rheostats in 1921

An unquestionable attribute to the merit of Fada rheostats is the universal approval of over half a million satisfied users.

As a parallel to this achievement, Fada announces a new rheostat—a better instrument for less money. This new Fada rheostat, using a special hard fiber resistor strip, represents the peak in rheostat design and finish.

This new fiber strip is specially treated and will not absorb moisture and corrode the wires. A notable advance in rheostat manufacture.

The new Fada rheostat, as a whole, is designed for use by radio enthusiasts who love to build for efficiency.

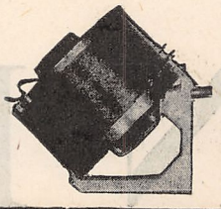
Truly, this is the rheostat you can buy with supreme confidence; one "you" can use in your set with genuine pride.

New grade hard fibre—Will not absorb moisture and corrode wires

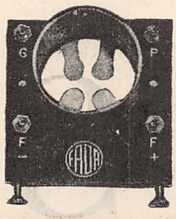
FRANK A. D. ANDREA

1581-A JEROME AVENUE NEW YORK CITY

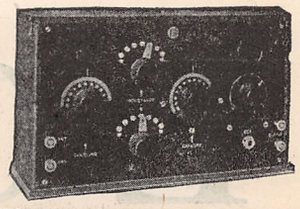
$4.75

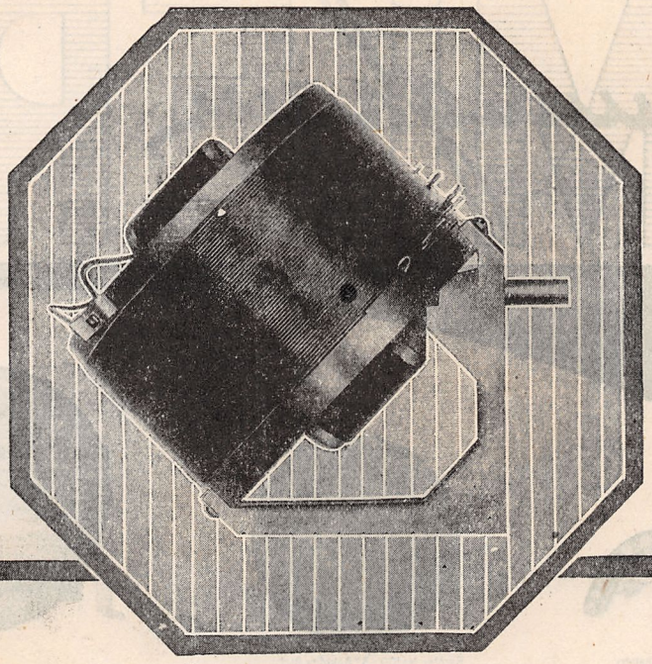


$1.00

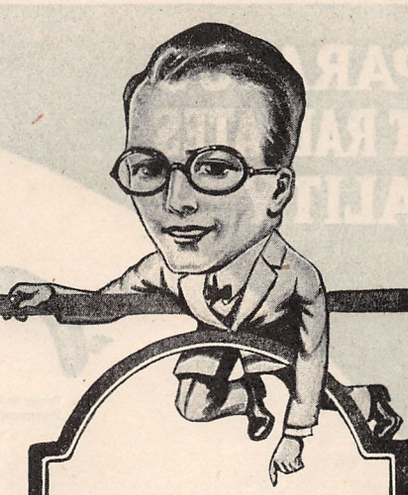


$27.00





$4.75



A Revelation of Clearness
The New Fada Vario-Coupler

This super-selective product of Fada ingenuity and thoroughness brings in signals with a clearness and freedom from interference never before realized in any single-tuning instrument. Singing, speeches, instrumental music, or whatever is transmitted on the resonant wave-length, comes surging in strong and clear without a buzz or squeal.

The home radio builder who takes pride in perfection will be delighted with the results achieved by using the New Fada Vario-Couper as the basis of his set. It is adaptable to any one of a dozen hook-ups, including the famous Armstrong super-regenerative circuit. Wherever used, it will amaze the experimenter with the clearness and precision of its results.

The superiority of the Fada Vario-Coupler is due to unique features embodied in its design and to thoroughness of workmanship typical of Fada construction.

See this new Fada instrument at your radio dealer's, and ask him for a copy of The Fada Handbook, which contains many helpful suggestions for those who build their own sets.

FRANK A. D. ANDREA

1581-A JEROME AVENUE NEW YORK CITY

7 Reasons Why You Need A Fada Vario-Coupler

1. The inductance can be varied by single turns from one to fifty-six. This permits tuning within one-half turn of the desired wave-length.

2. Doubly selective coupling due to 45 degrees position of the stator, making it continuously variable through 180 degrees instead of the usual 90 degrees.

3. One-piece die-cast aluminum bracket holds the parts securely in position. Stops molded as integral parts of the bracket and rotor.

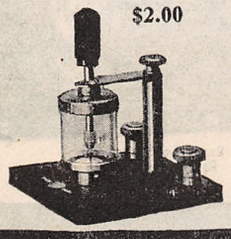
4. Perfect insulation. Windings of silk-covered wire, varnished with Visolac. Bakelite stator and molded Condensite rotor.

5. Connections of Belden braid, eliminating loose contact noises.

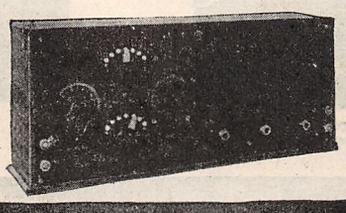
6. Adjustment against spring washers, which hold securely in any position, yet allow easy and critical variation when desired.

7. Fada workmanship throughout, which means ultra efficiency.

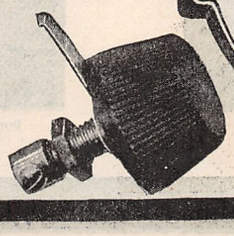
$2.00



$65.00



$.40



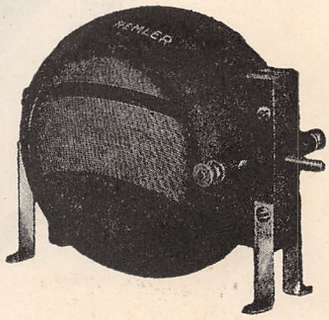
FADA

REMLER Cunningham

APPARATUS THAT RADIATES QUALITY

Remler No 93 A Battery Potentiometer Price 75¢

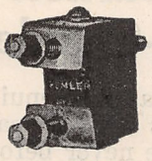
Remler No 100 - 3" Bakelite Dial and Knob 3/16 or 1/4 shaft Price 75¢



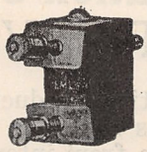
Remler Type 500 Bakelite Molded Variometer Price $7.50

Remler No 40 Bakelite Coil Plug Price 60¢

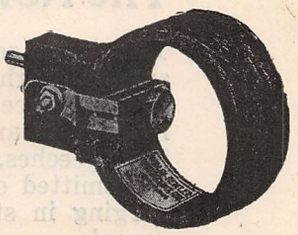
Remler No 42 Bakelite Panel Plug Price 60¢



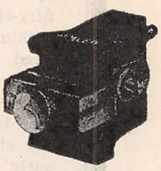
Remler No 43 Bakelite Coupling Plug Price 90¢



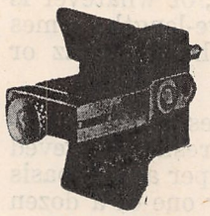
Remler No 46 Bakelite Coupling Plug with Binding Posts Price $1.00



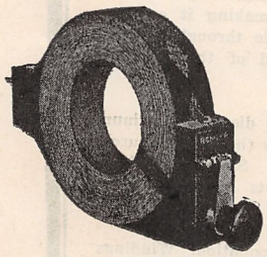
Giblin-Remler Inductance Coils 20 to 1500 Turns Maximum Inductance and Minimum Distributed Capacity



Remler No 48 Coil Mounting 20 to 750 turn coils Price 60¢

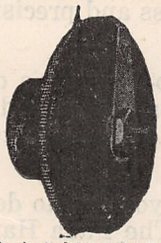


Remler No 49 Coil Mounting 1000 to 1500 turn coils Price 75¢



Remler QSA No 850 Tapped Coil Unit Price $6.00

Remler No 810 Junior Rheostat Panel Type Price 1½ amps. carrying capacity $1.00



Remler No 813 Heavy Duty Rheostat Panel Type Price 3 amps carrying capacity $1.75

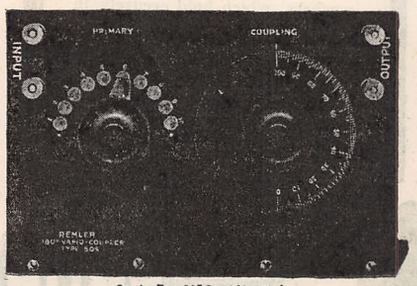
WHY REMLER STANDS

Pictured on these two pages is the famous Remler line of Quality Radio Apparatus built to serve the needs of the Amateur—built from the Amateur's point of view. Look the Radio field over—you will find that Remler Apparatus is often copied in design, but never equalled in quality. It is designed right, built right, priced right, and works right. It is the Quality Apparatus—sold under a genuine guarantee.

We urge you to look the Radio market over—to test Remler alongside any make of

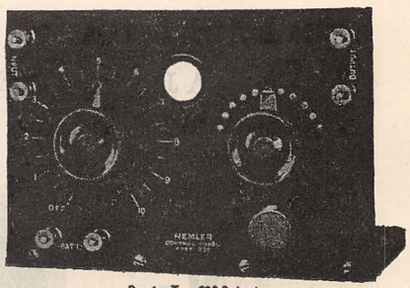
REMLER RADIO

Home Office:
248 FIRST STREET, SAN FRANCISCO, CALIF.



Remler Type 505 Panel Mounted Vario-Coupler Price $12.00

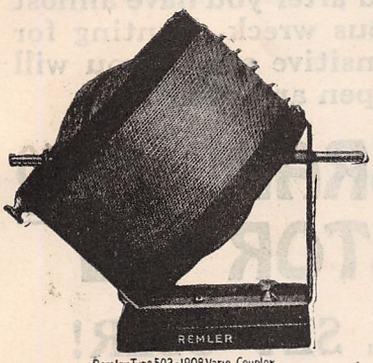
Remler Type 502 Panel Mounted Variometer Price $10.50



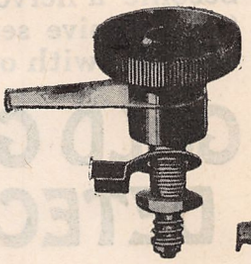
Remler Type 330 Detector Panel Price $8.50

Radio APPARATUS

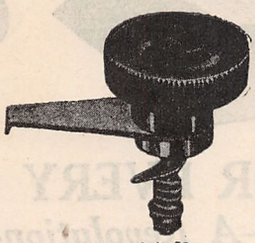
STANDARDIZE ON REMLER



Remler Type 503-180° Vario Coupler
Price $5.40

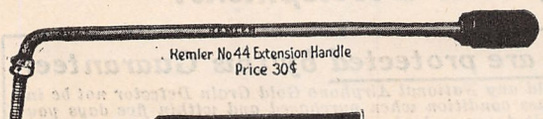


Remler No 90 - 1½" Bearing Switch Price 75¢

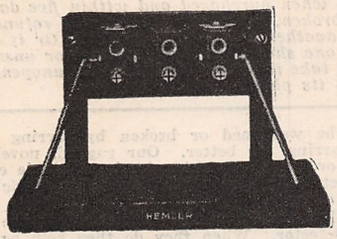


Remler No 82 - 1½" Plain Lever Switch Price 50¢

Remler No 94 - 1" Plain Type Lever Switch 1/4" Collar Price 40¢

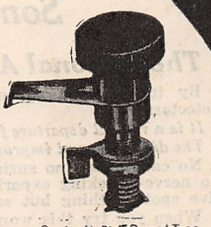


Remler No 44 Extension Handle
Price 30¢

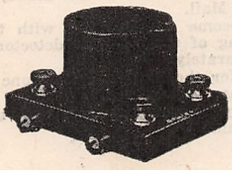


Remler No 400 3 - Coil Mounting
Price $7.50

Remler No 85 - N P Binding Post 3/8 x 1/2" Price 15¢



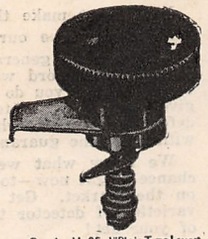
Remler No 91 1" Beanng Type Lever Switch Price 60¢



Remler No 92 Bakelite Molded V T Socket Price $1.00

Remler No 83 - 1" Plain Type Lever Switch - 3/16" Collar Price 40¢

Remler No 86 - N P Binding Post 1/2 x 3/4" Price 20¢



Remler No 95 - 1" Plain Type Lever Switch with No 10 Knob Price 50¢

FIRST IN THE RADIO FIELD

Radio Apparatus—results are its best sales argument—we leave it to your better judgment. See your nearest Radio dealer today—standardize on Remler Apparatus—it Radiates Quality.

NEW REMLER CATALOG

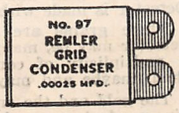
Send 10c for new 40-page Remler Catalog just off the press, containing circuit diagrams for Remler Apparatus and other useful information, including a table of inductance, capacity and wave length.

Remler No 84 - 1/4" One-Piece Slider Price 25¢

Remler No 10 - 1 3/8" Bakelite Knob Price 20¢

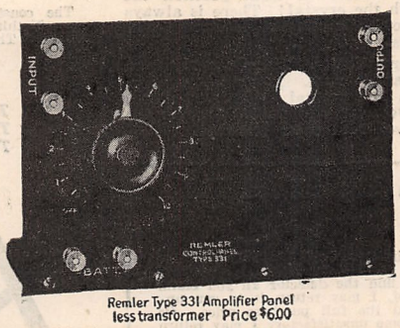
MFG. COMPANY

Eastern Representative:
154 W. LAKE STREET, CHICAGO, ILLINOIS



Remler No 97 Grid Condenser
Price 20¢

Remler Type 333 Amplifier Panel
less transformer Price $9.00



Remler Type 331 Amplifier Panel
less transformer Price $6.00

Remler No 96 Variable Grid Leak
Price 40¢

NATIONAL

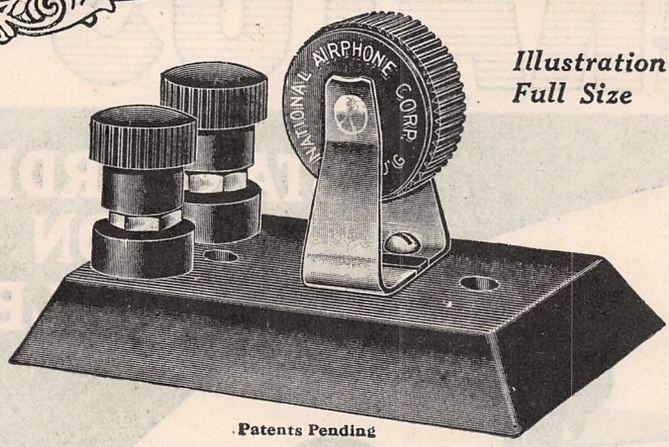


Illustration Full Size

Patents Pending

After you have fussed with catwhiskers, springs, balls and adjusting handles, and after you have almost become a nervous wreck, hunting for "the elusive sensitive spot"--you will welcome with open arms our 100%

GOLD GRAIN DETECTOR $2.50

GOOD NEWS FOR EVERY CRYSTAL SET USER!

Something New—A Revolutionary New Development!

The National Airphone Gold Grain Detector!

By its use you accomplish more than with any of the common detectors.

It is a radical departure from all other practise!

The difference and improvement are surprising.

No catwhisker, no springs, no balls, no adjusting handle, no fussing, no nerve-wracking experiences in trying to find the ever elusive sensitive spot—nothing but satisfaction!

When you try this wonderful detector you will understand one of the reasons why the National Airphone has been awarded the Certificate of Merit by the Testing Laboratories of the Radio News, New York Tribune and New York Evening Mail.

Users of crystal sets have become so disgusted with the constant fussing and tinkering and nursing of the old-style detectors they have urged us to sell our detector separately.

So to meet the demand we offer the National Airphone Gold Grain Detector, suitable for use with any crystal set.

Now you can throw away your old detector and attach ours, and bid good-bye to detector troubles!

The National Airphone Gold Grain Detector Beats All Others!

Ours is the most sensitive and the most practical detector in existence.

We cannot make this too emphatic.

Make us prove our words!

We know the general hesitancy to accept such a broad claim. So to back up our word we guarantee our detector to be satisfactory. If within 5 days you do not find it so, we will refund your money. We give you a year to test it. If through any fault of ours it becomes defective, return it whole, just as delivered. We will send you another with the same guarantee.

We know what we are talking about and we are giving you a chance—right now—to get a more satisfactory detector than any other on the market. Get one now and never again have any of the 57 varieties of detector troubles! Begin at once to really enjoy the use of your set!

This is Why Ours Must be Better!

Contact with the crystal of the National Airphone Gold Grain Detector is made with hundreds of loose grains of pure gold!

These grains are so placed that no matter in what position the detector may be, many grains must touch the crystal! There is always a multiplicity of contacts. The contact is constant. Not now and then, maybe and maybe not, but always.

The gold and the crystal are sealed hermetically. There can enter no air, no dust, no moisture. The gold cannot rust. It cannot oxidize. It is always clean. The contact with the crystal is always sharp. Get a National Airphone Gold Grain Detector and banish forever the detector annoyances that so often have tried your patience.

You are protected by this Guarantee:

Should any National Airphone Gold Grain Detector not be in first class condition when purchased and within five days you return it to us unbroken, or unopened, we will refund your money or give you another as you may prefer. Or if at any time within a year one should become defective or unsatisfactory to you we will take it back if unbroken or unopened and give you another in its place.

The contact cannot be weakened or broken by jarring or rough handling. The more jarring the better. Our rugged, novel detector is not delicate like the ordinary catwhisker kind. A single catwhisker is easily disturbed electrically and mechanically by static and too strong signals.

Such disturbances unless very powerful do not affect the National Airphone Gold Grain Detector. When they do they help by allowing more current to pass through. This produces better reception. You would not be bothered with the old kind of detector after one minute's use of ours.

As apparent, ours is not of the fixed or permanent variety. No detector can be permanent. Strong static charges will injure and destroy the sensitiveness of any fixed contact point. Then it is worthless. We accomplish what is claimed for the fixed type.

If static disturbs some of the sensitive points in our detector, tap lightly with your finger the revolving cartridge containing the grains and crystal and instantly you have a new, sensitive, perfect contact. You can repeat this procedure for years with the same detector.

Our detector "stays put." No fussy adjustments. You can let it remain unused for days at a time and then put your receivers to your ears and receive at once—nothing to do but perhaps tap the cartridge once, taking a second of time. This of course is impossible with any other crystal detector.

There is no better crystal than the kind we use. Specially selected for its high sensitivity and carefully tested.

You can snap the cartridge in or out in a second. Its temporary removal to prevent tampering with the instrument is sometimes a convenience.

No test buzzer is needed. Our detector is "always on the job," ready when you want it.

The construction is durable. Nothing but hard rubber composition is used for the base, cartridge and binding posts. The brackets are of heavily nickeled and polished hard spring brass. Two holes in the base for screwing to panel or table.

The Illustration is Full Size

The construction is permanent. The detector is delivered to you ready for use. Nothing to adjust, nothing to do when you get it but to snap it in and receive. The cartridge is sealed and cannot be opened without destroying it.

Price in the United States $2.50

TO DISTRIBUTORS: **Write for exclusive territory.**
TO DEALERS: **Write for discounts.**
TO YOU: **Order now from this ad. and see for yourself if our claims are not true.**

An Easy Way to Purchase--Use Coupon if You Wish

NATIONAL AIRPHONE CORPORATION,
18 HUDSON ST., NEW YORK.

Dear Sirs:

Please send prepaid to me one National Airphone Gold Grain Detector as advertised, for which I enclose $2.50 by ....Money Order....Registered Mail....Check. If within five days I do not find the detector all you claim for it or if for any reason I am not satisfied, I may return it to you unbroken or unopened and you agree to refund the full purchase price. Or if at any time within one year it should become unsatisfactory I may return it to you and you agree to send me another under the same guarantee.

NAME .....

STREET AND NUMBER.....

POST OFFICE AND STATE.....

NATIONAL AIRPHONE CORPORATION

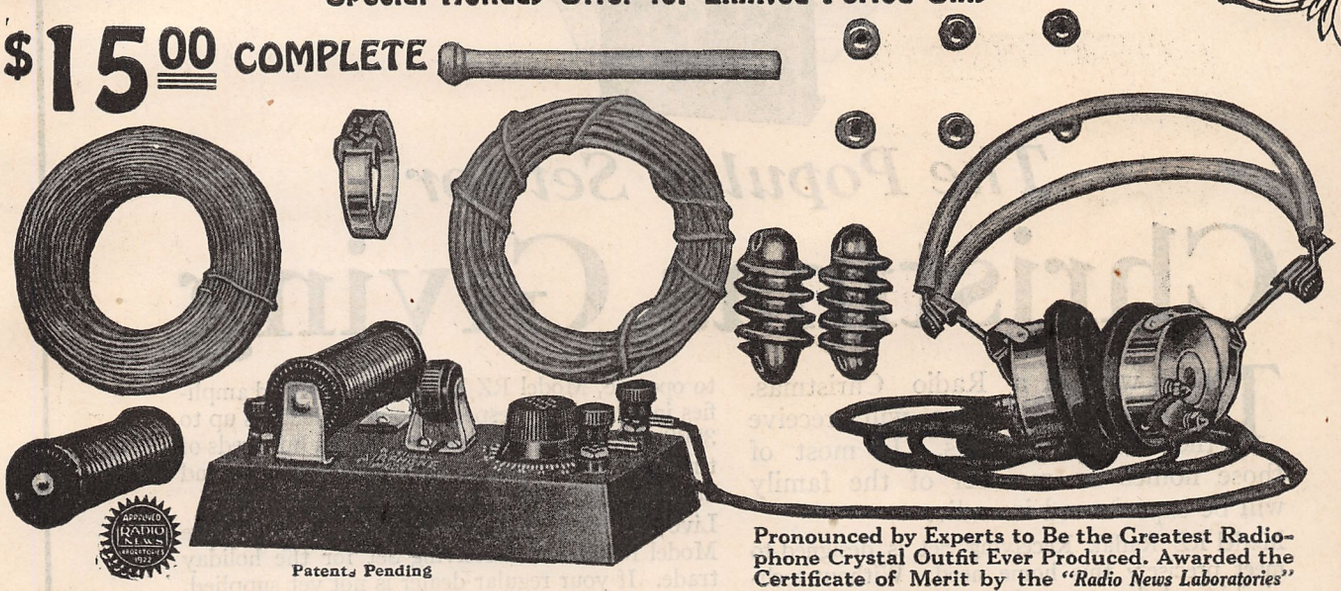
TRADE MARK REG. U. S. PAT. OFF.

18 HUDSON ST. NEW YORK

AIRPHONE

Special Holiday Offer for Limited Period Only

$15.00 COMPLETE



Patents Pending

Pronounced by Experts to Be the Greatest Radiophone Crystal Outfit Ever Produced. Awarded the Certificate of Merit by the *"Radio News Laboratories"*

Highest Grade Crystal Receiving Set

No Distortion. Perfect Reproduction of All Sounds With Extraordinary Clarity

Special for a Short Time

Many of our friends have asked us to furnish them with a complete Airphone outfit. The above special outfit has been made up by us for the holiday trade, and forms a wonderful Christmas gift, a gift that will be remembered and appreciated by every one.

The Airphone Radio Receiver comprises the following: 1 National Airphone, Model G, $12.50; 1 complete Aerial Outfit, consisting of: 150 feet first grade Aerial Wire, 25 feet Insulated Cable, 1 Ground Clamp, 2 Special Antenna Insulators, 1 Porcelain Tube for Lead-in, 6 Knob Insulators, valued at $2.50; 1 RICO Tripole Double Head Set, 2,000 ohms, $6.50; making a total of $21.50.

1 National Airphone, Model G	$12.50
1 Complete Aerial Outfit	2.50
1 RICO Tripole Double Head Set	6.50
Total Amount	$21.50

OUR PRICE $15.00

This is a wonderful offer; we advise immediate action, as all orders must be filled in rotation.

Outfit comes packed complete in a strong corrugated cardboard box, with individual boxing for the Airphone, for the Aerial Outfit and for the RICO Receivers. This outfit is complete in every respect, and you get it ready to set up and operate. Nothing else is needed.

If you have not read our former advertisements explaining the National Airphone, Model G, the following will give you detailed description:

It is a perfect crystal radiophone of compact and rugged construction, guaranteed to receive broadcast entertainment within a radius of 25 miles, and code signals 1,000 miles and over, depending on location and cartridge tuning coils used. The NATIONAL AIRPHONE is the highest attainment in crystal radio receiving sets and is the culmination of years of work by some of our greatest radio experts and engineers.

It is built along radically different principles and embodies in its superior construction all those features which inventors and manufacturers have been striving to achieve for years. By reason of its superior scientific construction there are no electrical losses whatsoever; not a piece of wood is used—only hard rubber composition. In the NATIONAL AIRPHONE every detail has been worked out carefully and logically. If you have ever experienced trouble with other crystal receivers and you know what an annoyance it is to fuss around with catwhiskers, crystals, sliders, springs and other fussy adjustments, the NATIONAL AIRPHONE will prove a revelation. You will know what pleasure it is to own "The little wonder AIRPHONE."

Super-Sensitive Detector

Our super-sensitive Gold-Grain detector is a revelation. It is positively more sensitive than any other crystal detector, and brings in the sounds incomparably stronger, clearer and louder than the ordinary catwhisker type. It is self-cleansing, remains sensitive practically all the time, EVEN DURING THE USUAL STATIC. See opposite page.

Tuning Condenser and Tuning Coils

By means of the tuning condenser interference can be eliminated successfully by merely turning the knob. If you wish to receive a station of longer wave-length, snap into place the interchangeable cartridge tuning coil, for which purpose two coils are furnished with each outfit. It will be noted that the variable condenser is of a special design, with mica dielectric, making it one of the best radio condensers known.

Construction

By reason of the highly-developed scientific construction of the outfit there are no electrical losses whatsoever, not a piece of wood being used, only hard rubber composition. All screws are secured with lock washers, impossible to become loose, and all necessary connections are soldered. The cartridge tuning coils are wound with enameled wire and calibrated for the right wave-lengths. Every part utilized in the manufacture of the NATIONAL AIRPHONE is rigidly tested and examined, and each AIRPHONE is separately tested under actual broadcasting conditions before shipment.

So Simple to Operate

To operate the NATIONAL AIRPHONE, just connect the aerial and ground wires to the proper binding posts and attach the head phones. Then, if you wish to listen to a broadcasting concert, snap into place the cartridge tuning coil marked "150 to 450 meters," turn the large knob of the tuning condenser while tapping the detector wheel slightly. If broadcasting is going on, stop the pointer of the condenser knob at the point where the sounds come in loudest and clearest. Leave the adjustment at that point and then ENJOY YOURSELF.

LOOK!!!

Dear Sirs:

The AIRPHONE purchased from you August 29th is giving unusually satisfactory results.

While you guarantee the AIRPHONE to receive only within a radius of 25 miles, I am receiving Pittsburgh, Pa., and Schenectady, N. Y., daily. Music and speech are clear but faint. I receive Pittsburgh on the 400 meter coil and Schenectady on the 500-1000 meter coil.

The World's Series results were received as loudly and clearly as anyone could wish and my friends, family and the management of the Hotel in which I live, are very much delighted with the results obtained with your instrument.

It is without doubt the most practical, simple and economical radiophone in existence and I find it a great pleasure to own one.

(Signed) LEE K. FRANKEL, JR.
141 West 73d Street, New York City.

If Your Dealer Cannot Supply the National Airphone Outfit, Mail This Coupon Today!

NATIONAL AIRPHONE CORP., R. N. 12
18 Hudson Street, New York City.

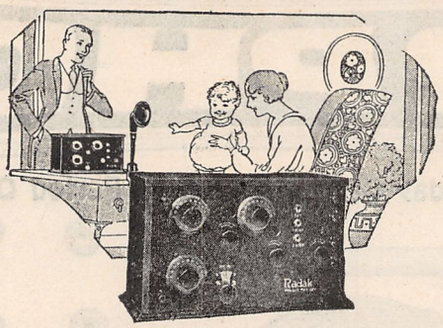
Gentlemen:

Please send me, prepaid, one (1) guaranteed NATIONAL AIRPHONE OUTFIT, as advertised, for which I inclose { money order / check } for $15.00. If at the end of five (5) days I should not find the outfit to be all that you claim for it, I will return it promptly and you will refund me the full purchase price.

NAME.....

Street Address.....

City and State.....



The Popular Set for
Christmas Giving

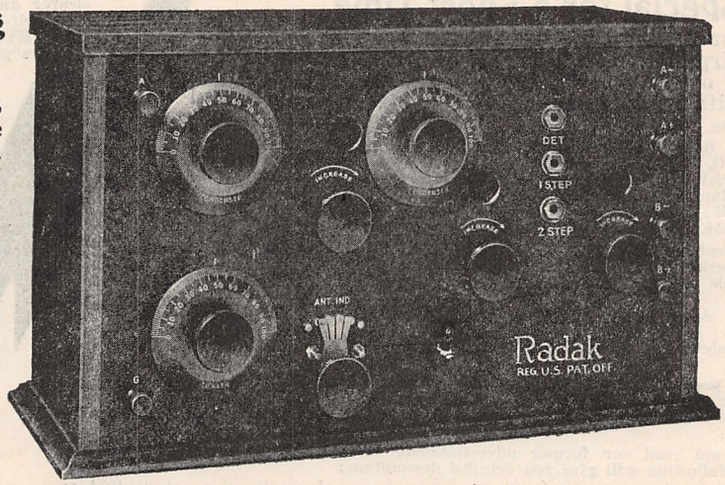
THIS will be a Radio Christmas. Thousands of homes will receive their first radio sets. In most of those homes no member of the family will be experienced in radio.

Model RZ Radak Receiving Set is designed to meet precisely this home need. Without technical knowledge or previous experience in radio, *anyone* can operate this set with astonishing results. Simple to install and even more simple to operate, Model RZ Radak receives and amplifies in one unit. Responds to wave lengths up to 3000 meters and increases the sound hundreds of times. With a loud speaker the volume of sound amazes even the hardened radio professional.

Live electrical and radio dealers will feature Model RZ Radak Receiving Set for the holiday trade. If your regular dealer is not yet supplied, write us for complete information regarding this and other Radak Sets ranging from $40 up. Radio Equipment Catalog 6 cents.

Model RZ Radak Receiving Set—Price $100

Cabinets of world's finest woods, handsomely finished. Indestructible black metal dials. Hard rubber composition binding posts. Vernier variable type condensers. Antenna inductance wound on formica tube; plate inductance on moulded ball. Fan blade switch. Clapp-Eastham Type H 400 Rheostat. Single circuit regenerative. *Licensed under Armstrong U. S. Patent 1113149.*



A Typical Radak Experience

La Salle, Ill., July 27, 1922.

"Having purchased one of the Clapp-Eastham Type H. R. Sets, I think they are the best set on the market for results. Last Thursday night I was operating my set and tuned in some music very loud. I was pretty sure it was a station that I never heard before, so I waited for the station to sign off. When the station signed off I found out it was Station KNT at Aberdeen, Washington, which is a distance 1800 miles from La Salle, Illinois."

ELTON K. HARTENHOWER.

Radak

Registered U. S. Patent Office

Reliable Receiving Sets

CLAPP-EASTHAM COMPANY

107 MAIN STREET : : CAMBRIDGE, MASS.

America's Oldest, Largest Manufacturers of Radio Equipment Exclusively. Established 1907

RADIO NEWS

H. GERNSBACK—Editor and Publisher
ROBERT E. LACAULT—Associate Editor

EDITORIAL AND GENERAL OFFICES, 53 PARK PLACE, NEW YORK

Vol. 4 DECEMBER, 1922 No. 6

Popularizing Radio

A Double Barreled Scheme

THE question has been asked, time and again, during the past few months, "What is the matter with Radio?"

After an unprecedented boom in radio during the latter part of the winter and the early spring, things slumped alarmingly, for no apparent reason. Had the public suddenly become tired of radio, or had all the radio apparatus been sold that one could hope for in the United States? The answer is lengthy:

Fundamentally there is nothing wrong with Radio, but so far Radio has struck only the big centers. Only in the immediate vicinity, within five or ten miles of a broadcasting station has Radio shown any marked success. Seemingly, up to the present point of writing, which is the middle of October, the point of saturation has been reached as far as these centers are concerned.

We are now confronted with the mathematical problem which simply amounts to this: How many people within a 10 or 25-mile radius of a large broadcasting station can afford to buy a radio outfit? As soon as the distance from the broadcasting station is increased over 25 miles, the chances of having many receiving outfits becomes smaller and smaller. The reason is obvious: Within a radius of 25 miles a crystal set will do nicely. These crystal sets can be bought at very reasonable figures. Only the man with money to spend can afford to get a vacuum tube outfit, and while, of course, vacuum tube outfits are superior to the crystal outfits, they cost a great deal more and are more complicated. The problem then becomes one of dollars and cents. The farmer 50 or 100 miles away from a broadcasting station is not apt to spend $100 to $200 on a vacuum tube outfit unless he is an amateur himself, or is a very up-to-date man. He would not mind trying a crystal outfit, but he knows that he can not use it at that distance.

So we have the condition today that over one-half of the population of the United States is being deprived of radio entertainment for the reason that the farming and agricultural districts as a rule are out of range and are not in a position to invest, for many reasons, in expensive vacuum tube outfits. This is not a mere guess, but the Editor has talked with many farmers and small business people in outlying districts who positively refused to spend more than $25 on radio at the present time. To be sure, things may change in the future as the agricultural and farming districts become more educated, but just now they are "sitting tight."

How, then, can this condition be changed? The writer suggests the following plan, which throws an entirely new light upon the broadcasting situation, the scheme, to the best of the writer's knowledge, never having been tried before.

Suppose an up-to-date amateur, or business man for that matter, was told that with practically no outlay, he could make several thousand dollars a year out of radio broadcasting. Would he not jump at the chance? This is exactly what this scheme means. It is nothing less than *broadcasting broadcasting.*

We know that most of the large broadcasting stations at the present time are receiving Arlington Time Signals on a special aerial on a wave-length of about 2,650 meters; a special receiving set is maintained for these time signals. At noon and at 10 p.m. these time signals are re-transmitted on a wave-length of either 360 or 400 meters. The telephone of the receiving outfit is simply held against the microphone of the sending outfit at the broadcasting station and the signals are thus re-transmitted.

Why not do the same thing with broadcasting programs? Suppose we have a small town of 3,000 inhabitants 100 miles away from the nearest broadcasting station. No one in that town, unless he has a good vacuum tube outfit can possibly listen in to any entertainment, and if you canvass such a town you will find that there are not six such outfits in the whole community. Now, then, suppose some wide-awake amateur should equip himself with a first-class vacuum tube receiving set. This set should be an efficient loop set, preferably. Then he would also install a low-power radio telephone sending outfit. This outfit would not have to be rated higher than 10 watts. Such an outfit would cost less than $200 to assemble, including the receiver. Once the modulation problem was solved, and RADIO NEWS has printed and will continue to print articles on this subject, it would be a very simple matter for the amateur to re-transmit from a wave-length of 360 to 400 meters and re-broadcast the broadcast on a 200-meter wave-length. He would have little trouble securing the necessary license from the nearest Customs House for this purpose.

Now for the best feature of the scheme: With a good 10-watt transmitter it should be possible to reach everybody within a radius of 10 miles, sufficient, in other words, to reach everybody in town. Of course there would be needed a good transmitting aerial, but this is a matter in which we need not instruct any first-class amateurs.

The minute his station is completed, the amateur would take a simple crystal outfit, of which many can be had today for $15, complete with aerial, and visit some of his friends. He would put up a temporary aerial and let his friends and acquaintances listen in to his evening programs.

No! He would not sell, or try to sell the crystal set to them—and here is suggested a new idea: HE WOULD RENT IT! You do not buy your telephone today, but you pay so much per month to the Telephone Company. Exactly so in radio. A simple contract blank could be made out whereby the subscriber agrees that upon the installation of the outfit he will pay at the rate of $2 per month.

Now, the wholesale price of a good crystal outfit, complete with phones, aerial, etc., can be had for from $10 up. Furthermore, it would not be necessary for the amateur to lay out a single dollar, for if he should be able to secure anywhere from 50 to 100 subscriptions, he could take these contracts to his bank and if the young man is at all in good standing in the community, he will have no trouble whatsoever in securing a loan from the bank with which to purchase the outfits, the bank holding the contracts as security for the loan.

Now let us see how it works out in dollars and cents:

100 Crystal Outfits, at $10 each	$1,000.00
Radiophone Transmitter	75.00
Total Costs	$1,075.00
INCOME	
100 Subscribers at $2 per month for 12 months	$2,400.00
Deducting the original cost	1,075.00
Net profit	$1,325.00

And all this requires no investment! This is for only 100 subscribers. In a town of 4,000 it would be less than 3 per cent It should be possible to get at least 10 per cent in any community, providing good results can be shown, in which case the profit will be over $3,000 net per year, a thing not to be sneezed at these days.

At one bound, therefore, we can put the entire country in touch with the broadcasting stations where only 40 or 50 per cent are in touch now.

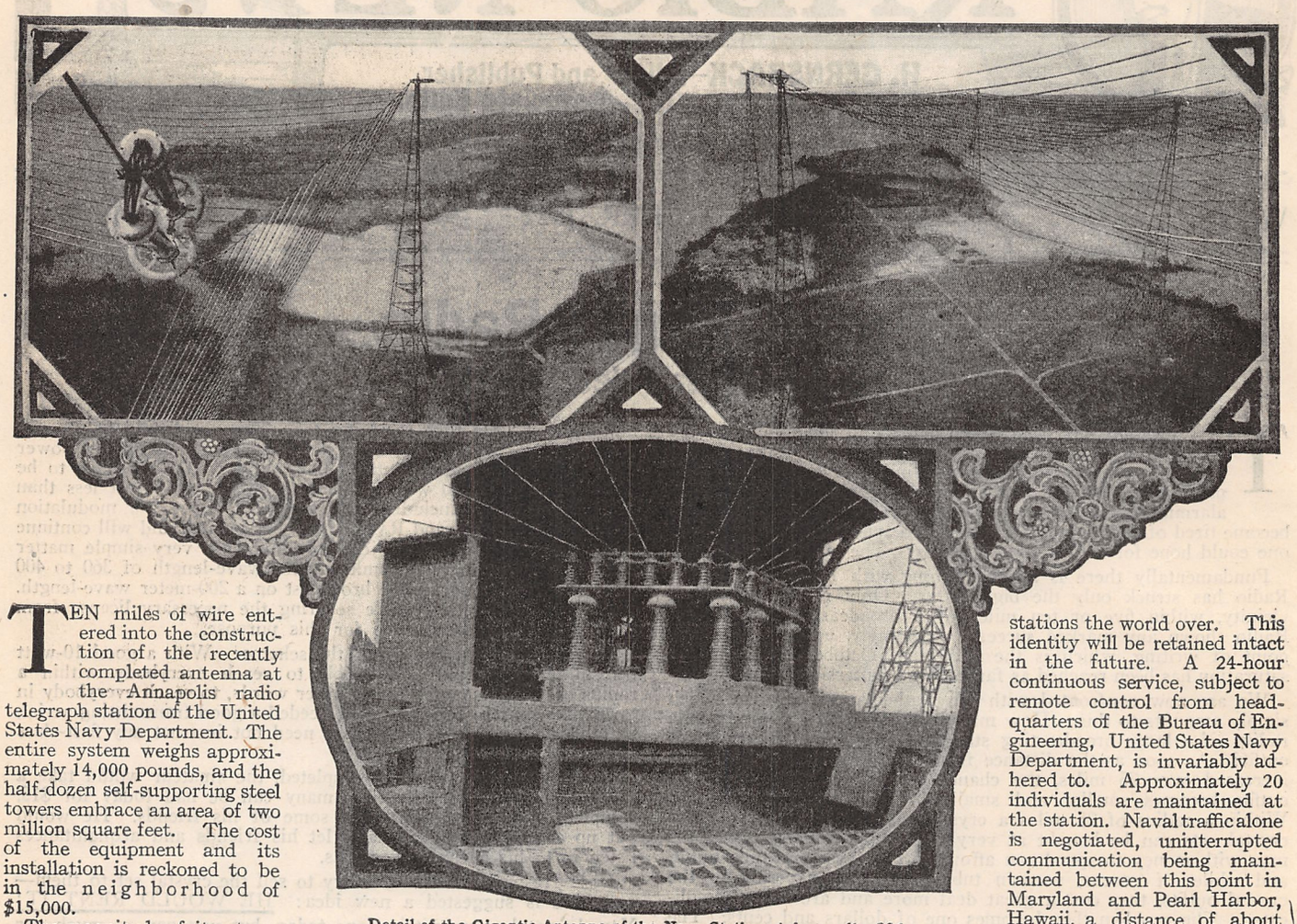
There is no reason at all why this scheme can not be put into use immediately, and the writer will be glad to assist the first few pioneers who try, in every way possible. The idea is sound economically as well as technically, and there is not reason why it should not be possible to put it into use immediately.

The Technical Department of RADIO NEWS stands ready to give all technical assistance and advice to those who wish to try the idea on either a small or large scale.

H. GERNSBACK.

New Antenna Has Ten Miles of Wire and Weighs Seven Tons

By S. R. WINTERS



Detail of the Gigantic Antenna of the Navy Station at Annapolis, Md.

TEN miles of wire entered into the construction of the recently completed antenna at the Annapolis radio telegraph station of the United States Navy Department. The entire system weighs approximately 14,000 pounds, and the half-dozen self-supporting steel towers embrace an area of two million square feet. The cost of the equipment and its installation is reckoned to be in the neighborhood of $15,000.

The magnitude of its structural details, however, should not overshadow the main objective, namely, an enlarged usefulness. This high-power radio-telegraph station, located at Greenbury Point, Maryland—three miles by air-line from the Naval Academy and 40 miles from Washington—will be doubled in efficiency. The antenna capacity of the newly installed system will be approximately three times that of the radiating unit which it displaces.

"Annapolis," in terms of radio-communication, is already customarily identified with the transmission of long-distance intelligence. Established on October 1, 1918, this station may be said to have sprung from war-created difficulties. Instantaneous communication with European points during the world conflict was an insistent service rendered, which placed it in the forefront of high-power stations the world over. This identity will be retained intact in the future. A 24-hour continuous service, subject to remote control from headquarters of the Bureau of Engineering, United States Navy Department, is invariably adhered to. Approximately 20 individuals are maintained at the station. Naval traffic alone is negotiated, uninterrupted communication being maintained between this point in Maryland and Pearl Harbor, Hawaii, a distance of about 5,000 miles, radio-telegraph units on the Pacific Coast of the United States, and with European points.

The antenna system recently installed involves the use of six 600-foot self-supporting steel towers, superseding the four 600-foot towers in service since the station was built. Enough acreage is covered by these towers, 2,000,000 square feet, to permit of gardening or intensive farming. The arrangement of

(*Continued on page* 1233)

U. S. Radio Communication System Covers the World

WHEN Secretary of the Navy Edwin Denby recently authorized 12 destroyers to proceed from Hampton Roads, to Constantinople, Turkey, facilities for receiving communication by radio telegraph were as much a part of these American warships as the vast quantities of food and medicine included in the cargo for relieving the sufferings of refugees in the Near East. Just as the law follows the American flag, wireless receiving equipment is an integral part of destroyers, whether they are cruising in home or foreign waters.

When the order of the Secretary of the Navy was issued for the equipping of a dozen additional warring vessels for service in the Near East, already eight destroyers were in the vicinity of Constantinople. And, as remarkable as it may seem, these American vessels in the far-away Near East—with thousands of miles of land, water, and space intervening—were in possession of facilities for the reception of radio-telegraph communication from the Communication Office of the United States Navy Department in Washington, D. C.

The world-wide communication system of the Navy Department enables a message written by the Secretary of the Navy or other authority to be placed in the hands of the remote-control station in the Navy building in Potomac Park, whence it is relayed by

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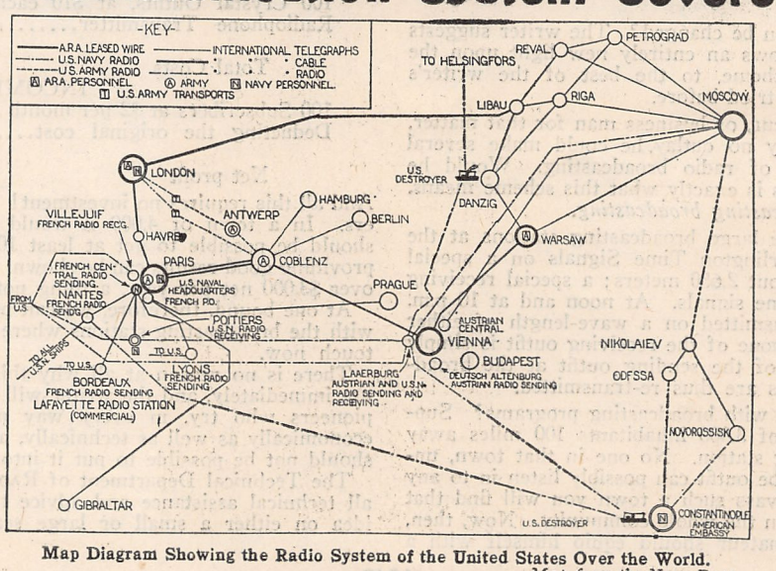


Map Diagram Showing the Radio System of the United States Over the World.
—Map from the Navy Dept.

A Few Facts About Modern Arc Transmitters

By C. C. CHAPMAN

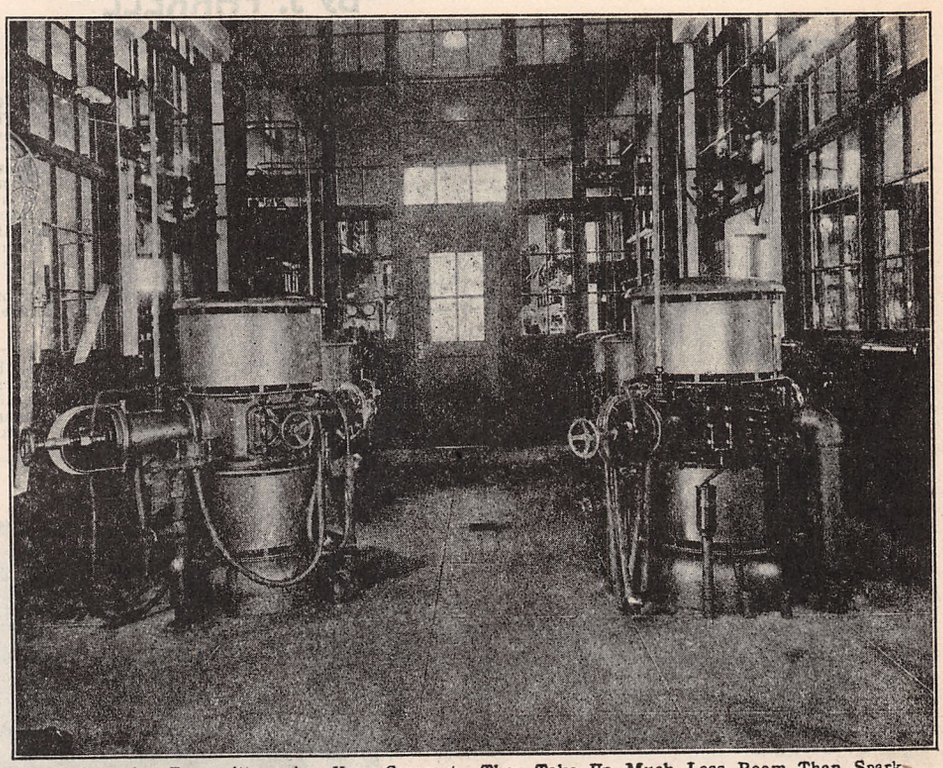
THE large number of articles that have appeared from time to time comparing the efficiency of the arc radio transmitter with that of other types of continuous wave radio transmitters, notably the high frequency alternator and valve or tube transmitters, has impelled the writer to set forth a few facts concerning the recent developments that have taken place in the construction of arcs and their attendant radio frequency circuits.

Since the advent of the audion receiver and particularly since the development of the amplifier, there has been an increasing number of complaints concerning the so-called "mush" and harmonics produced by the arc converter.

Some of these have been legitimate and originated at points that were actually operating under difficulties produced by the close proximity of high-powered arc transmitting stations. The greatest amount of publicity given the supposed interference from arc transmitters has, however, resulted from a moderate amount of just complaint that has been seized upon and enlarged by proponents of systems of radio telegraphy other than the arc and by aspiring young writers whose knowledge of the merits of either the arc or other systems has been rather mediocre, but who have joined the ranks of the antagonists of the arc merely because it seemed the logical thing to do, as no one had come to its defense.

Among the principal reasons for the attack upon the arc lies the fact that it is human nature, and this applies particularly to the radio world, to herald every new development as a distinct step in advance of all that has gone before.

First in the field of the high-power continuous wave transmitters was the arc converter, then came the high frequency alternator and last the vacuum tube, variously described as the "valve" or "tube" transmitter. Each in its turn was looked upon as better than anything that had gone before and, in the glamour attendant upon the entrance into the limelight of the newest born in the radio family, the elder members have been pushed to the background in the minds of the public who forget that the largest amount of the world's long distance radio communication is still being carried on by means of the old reliable arc.



Modern Arc Transmitters Are Very Compact. They Take Up Much Less Room Than Spark Sets of Equal Power. This Photograph Shows the Transmitting Room at the Palo Alto Station.

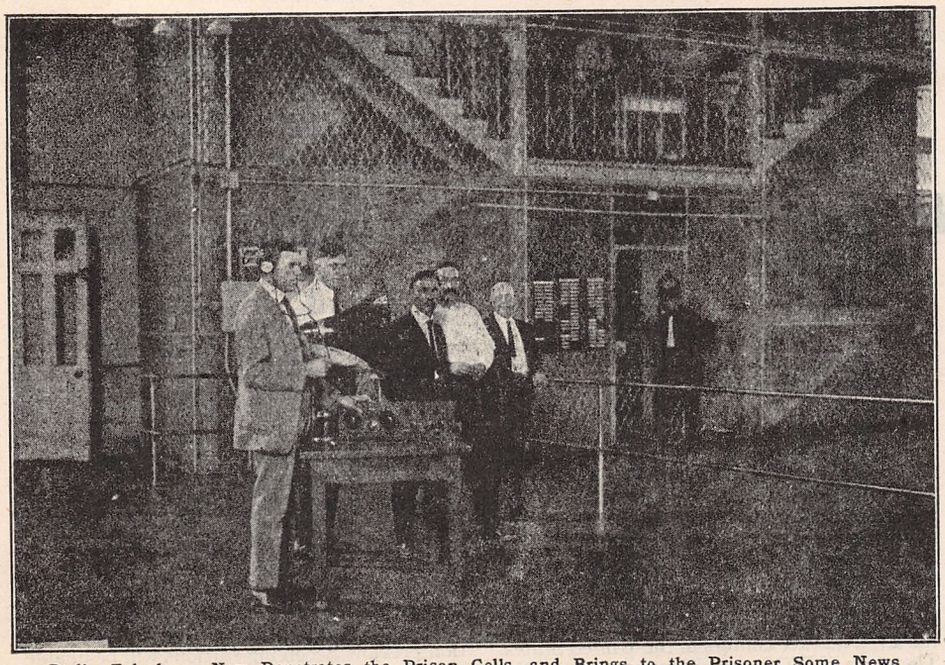
No attempt will be made to point out the superiority of the arc as regards simplicity, ruggedness and reliability over any other type of high power radio transmitter that has yet been developed. In fact there is no intention of drawing any comparisons whatsoever between the arc and other type of radio transmitter: this article has been written for the sole purpose of correcting mistaken ideas which seem to be current regarding the quality of signals produced by and efficiency of the arc, and the amount of care it requires.

It is generally believed that all arc stations

(*Continued on page* 1197)

Going to Jail with the Radio Telephone

By S. R. WINTERS



Radio Telephony Now Penetrates the Prison Cells, and Brings to the Prisoner Some News of the Outside World.

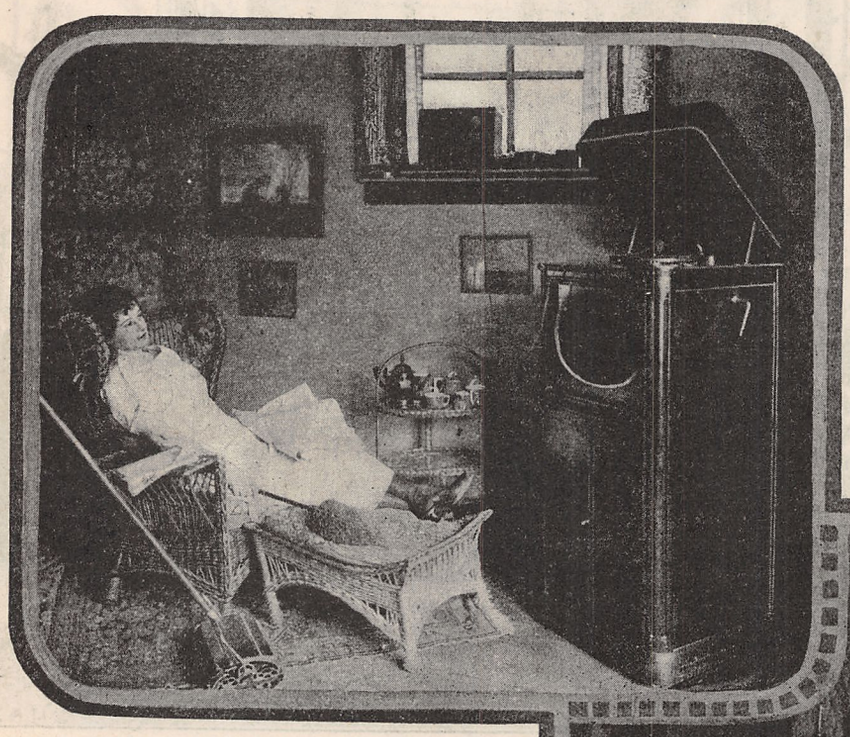
IF Richard Lovelace, the poet, had lived in the twentieth instead of the fifteenth century, when he penned his immortal verse, "Stone walls do not a prison make, nor iron bars a cage," one would be prone to attribute his buoyant frame of mind to the opportunity of hearing concerts by radio telephone when confined to a cell. Such was not his privilege, however. More fortunate will be the inmates of the penal institutions of today, if the advantages of wireless installations are realized in their behalf. The sordid experiences of an ill-advised life and the punishment of days, months, and years in dreary confinement may be lessened in severity by music, song and story which pierce prison walls when borne on the medium of electromagnetic waves.

On the outskirts of the National Capital, two and one-half miles from the White House, is located the jail of the District of Columbia. Here in this sombre-looking 45-year-old brick building, where, for each year the structure has been maintained, one person has been executed on the gallows, was recently staged a novel demonstration. A radio-telephone receiving set was installed for a single evening for the purpose of determining the practicability of wireless installation in this and similar penal institutions in the United States. The entertaining qualities of this universal

(*Continued on page* 1199)

The Housewife's Radio

By J. FARRELL



At Left—The Tired Housewife of Today can Lighten Her Burden by Means of Radio and Also Receive Useful Cooking Recipes as Sent by the Department of Agriculture.

Below—Radio Entertainment Is Becoming Popular at Tea Parties.

WHEN Jamieson entered his apartment that evening, an unaccustomed odor filled his nostrils. His thoughts fled back to a small New England homestead. His mother was bringing in the noon-day meal. The steaming roast chicken, mashed turnips, potatoes and all the other accessories to a New England feast gave off a delightful pungency of smell. Later, there would be a hot mince pie.

The vision passed. Yet the odors persisted. It occurred to him that his wife had not greeted him. Puzzled, he went into the kitchen. Mrs. Jamieson was taking something from the oven. He looked. He rubbed his eyes. Then he looked again. Roast chicken! Mashed turnips! Cranberry sauce! Mashed potatoes! And there on top of the range waiting to go into the oven—a bulging mince pie!

"Why, Anna!" he exclaimed.

"No, the delicatessen shop hasn't gone out of business," she laughed. Then she placed a finger on his lips. "Radio!" she whispered.

"Radio? What do you mean?"

After dinner Mrs. Jamieson explained it. She started with a rhetorical question.

"What do you suppose I've been doing with the receiving set while you were at business? Well, about six weeks ago the Department of Agriculture began to teach home economics by radio. The 'Agriogram' service they call it. It's a funny word, but I suppose they wanted to work 'agriculture' into it. The agriograms are just short paragraphs about agriculture, and the cooking recipes and instructions are only a part of the service. Somehow—I don't know why—the first paragraph they sent about cooking food interested me. It was something about whipped cream. The next one was about different cuts of meat. At the end of the message the speaker said that recipes could be obtained from the department and I sent for some. One of the paragraphs told how to cook veal properly, and so on. Every report has something about home economics, how to buy food, how to prepare it and cook it. First thing you know you'll actually be saying 'Just like mother used to make.'"

Mrs. Jamieson is but one of the thousands of American housewives who have enrolled themselves in the Department of Agriculture radio course in home economics. Indeed, if the early interest in the department's new service is any indication of what is to follow, the turning point in American home management has come. For the delicatessen eater will soon occupy a place with the dodo and the auk.

(*Continued on page* 1237)

Standardization Needed in Broadcasting Market News

By DANIEL C. ROGERS*

AGRICULTURE is perplexed with a new problem in standardization. It is the problem of standardizing blank forms on which radio receiving stations may copy the vast amount of market news information on live stock, grain, fruits and vegetables, dairy and poultry products, cotton, wool and other farm products, which is being broadcasted by such powerful stations as WOS of the Missouri State Marketing Bureau, located at Jefferson City, Mo.

WOS is one of the few 500-watt sets in the country. It replaced on August 19 the small broadcasting outfit which has been used by the Missouri State Marketing Bureau from the very beginning of the movement to broadcast market news on agricultural products. WOS is now heard consistently in every state in the Middle West. Including both day and night ranges, 27 states have been heard from. These include points in Massachusetts, New York, New Jersey, North Carolina, Florida, Alabama, Mississippi, Texas (Laredo), Colorado, Arizona, Wisconsin and Minnesota, and 15 other nearer states.

It is obvious that the Missouri State Marketing Bureau cannot build up and maintain an organization of the several thousand receiving stations that are copying and using the Government farm market news being broadcasted from WOS at Jefferson City five times daily: 9.30 a. m., 11 a. m., 2 p. m., 5 p. m. and 8 p. m., received from the Government-leased telegraph wire connecting WOS with all the large market centers in the United States. Therefore, if WOS, and other powerful radiophone stations which might later also go extensively into the broadcasting of market news on agricultural products, are to render the maximum service in this important field, blank forms on which to copy the information must be standardized and made available to all receiving stations through the local stores which handle stationery.

"STANDARDIZE THE AGRICULTURAL PRODUCTS MARKET NEWS BLANKS USED IN RADIO BROADCASTING," is the slogan from Missouri. There are a large number of blank forms afloat—all different. This lack of standardization of blank forms is certain testimony that the subject matter broadcasted is not uniformly composed for distribution. So long as this situation prevails, receiving stations will be unable to give their maximum cooperation in this

(*Continued on page* 1239)

**Missouri State Marketing Bureau.*

The Influence of Horn and Diaphragm on Sound Waves With Special Reference to Radio Loud-Speakers

(An Elaboration of Mr. Gernsback's Editorial in the October Issue)

By HERBERT E. METCALF*

THE radio public today, being vitally interested in any advances which might tend to increase the efficiency and enjoyments possible from a radio-receiving set, have watched with great interest the situation in the radio trade as regards loud-speakers of various sorts.

The loud-speakers now on the market range from a small cheap horn to which the ordinary phones may be clamped, to specially built Baldwin types with accompanying horn, and on up to the electrodynamic type known as the Magnavox type.

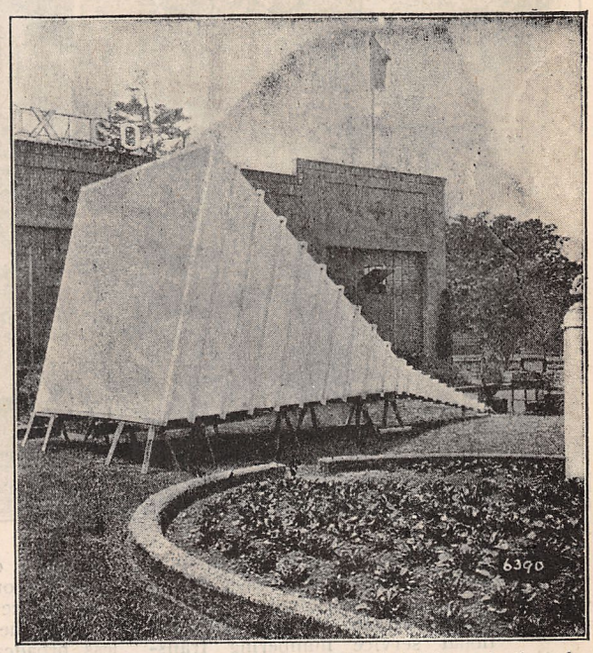
In reading over the advertising of these various makes of horns the average radio enthusiast becomes greatly mixed up in sizes, and designs of horns and diaphragms, each one claiming particular features which place that particular horn in the lead. This article is written with no thought whatsoever of discrediting in any way any advertising or claims of any manufacturers, but rather to place before the thinking radio public the facts obtained from the experimental study of several thousands of different horn designs, covering a period of over five years, reinforced by quotations from competent authority.

In the first place, the horn as used on a phonograph or radio reproducer is in no sense to be compared with the sounding board of a piano. Whatever vibrations the walls of the horn may make are relatively feeble and are due to the reaction of the air, which is already in vibration upon its walls, whereas in a sounding board such as used in a piano, violin, etc., the air itself is set into vibration by the action of the soundboard as the source. Therefore, in this discussion nothing will be said in comparison of these two devices operating on different principles, for two entirely different purposes.

To discuss the reason for the use of the horn, it will be necessary to carefully define what a horn really is, and why it is used at all, before discussing its design. A horn as usually designed is a more or less conical tube one end of which, the smaller, is connected to a sound box in which the diaphragm generates the air vibrations, and the larger end opening in some manner to the free air. This horn serves to reinforce the vibrations which are supplied to it because of the resonance properties of the air contained therein. The horn itself is incapable of actually originating any component tone and, therefore, it cannot actually add anything to the composition of the sound. But, while it cannot *add* anything to the sound, it can *take away* from the sound by absorbing or dissipating some of the energy of the vibrations at certain frequencies, and in that way may make a greater or less change in the final tone quality.

In other words, to quote from D. C. Miller in *The Science of Musical Sounds*, "The quantity and quality of resonance depend mainly upon the volume of the inclosed air, and somewhat upon its shape."

You will notice that the above quotation makes no mention of the material, and only minor mention of the shape. However, it is important that the material of the horn be at least rigid enough to withstand vibration to great enough extent to absorb any great degree of vibration.



A Very Large Horn Which Gives Wonderful Reproduction of Radio Speech and Music, Even at Low Volumes.

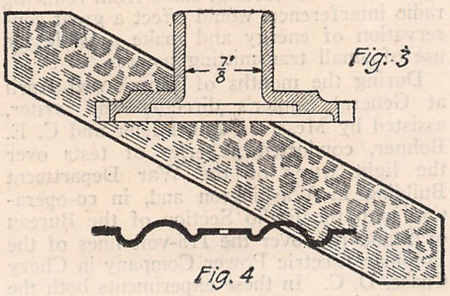


Fig. 3 Above Shows the Shape of the Upper Part of the Sound Box, While Fig. 4 Below Is the Shape of the Diaphragm.

Metal, such as sheet zinc; copper, thick and thin; thin wood, and artificial stone, as well as various kinds of fabricated fibre, have been carefully investigated as to their absorbing qualities and it has been found that a metal horn, when properly designed, gives exactly the same results as the identical shape and size in any other material, provided the interior finish is the same. Many hundreds of people have been used as subjects, and when their backs are turned they can merely guess whether metal or other material is being used, but absolutely fail to discriminate as regards tonal values. The horn on the Edison phonograph, admitted by all to be free from tinny sounds, is metal, and was designed by the man who undoubtedly knows more about acoustics and horn design than anyone else in the world today.

From the results of many experiments it has been found true that with certain limits, the bigger the horn and consequently larger amount of resonant air, the better the reproduction. One horn in particular, Fig. 1, was made of heavy spruce with an opening at the large end 12 feet square. The results obtained from this horn were remarkable, not from the fact of its shape, as it is simply a double pyramid, each with a constant taper, but purely and simply due to the fact that it is very large and that its fundamental is much lower than the lowest tone which is to be reproduced. In other words, a horn to be satisfactory must be long enough and inclose air enough to have a fundamental far below the lowest note to be reproduced. If the horn is too short, the response to high tones will be all right, but the response below the fundamental will be much feebler.

This conclusion simply means that no small horn can hope to attain the excellent results given by a large horn, and while it would be nice to be able to give everyone in his house a large horn, this would be commercially impossible. However, the best horns on the market today are at least those which are large enough to have a low fundamental, and have a rigid wall, no matter of what material the wall is made.

Flare on the outer end of the horn has a great effect on reproduction. Horns of the same shape but with differing flares give far different responses. The maximum bell flare has the tendency to make the natural periods indefinite, but has the disadvantage of heaping up the maximum response near the fundamental of the horn, which is not to be desired in all cases. Naturally, then, a medium flare, neither too great nor too little, will give the horn a good distribution of response but not too great a response at the fundamental.

The finish on the interior of the horn is important. If the walls are rough then they have the faculty of being able to absorb certain frequencies to a certain extent, and by proper design of the rough surface certain qualities of reproduction which are not desired may be eliminated.

After a careful investigation of many thousands of horns in regard to their quality of resonance the engineers of a western manufacturer of loud-speaking reproducers decided upon the gooseneck type of horn in two sizes as apparently being best for the

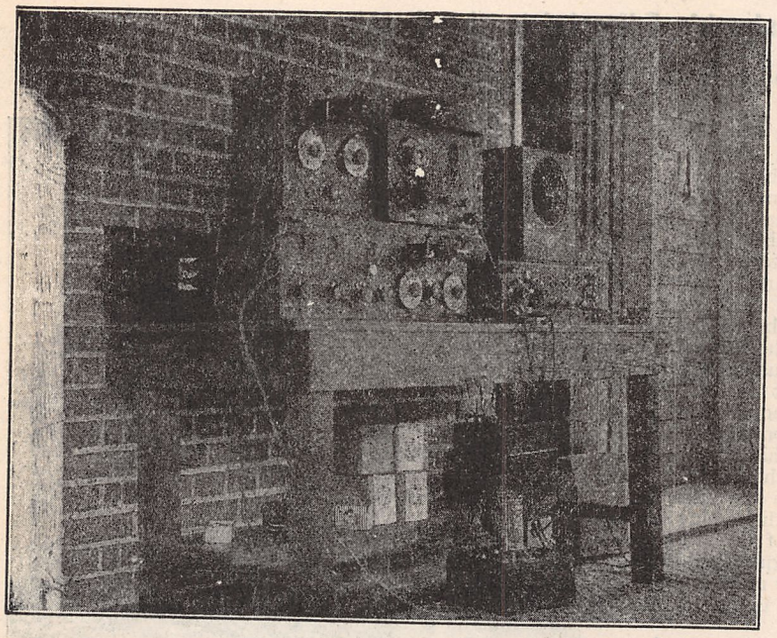
(*Continued on page* 1124)

The Shape of Large Horn With Low Fundemental but Without Acoustic Finish. Rough Finish Put On Later With Heavy Crystalline Deposit.

*Radio Engineer, The Magnavox Company.

Broadcasting by Wired-Wireless

By R. D. DUNCAN, Jr.*



The Complete Receiving Station Used in the Experiments on Line Radio. Several Types of Receivers Were Used for Comparative Tests.

DURING the last year and a half, radio broadcasting has grown from an experiment, restricted mainly to one locality, to a national service numbering transmitting stations into the hundreds, ranging from the powerful ones of the Westinghouse and General Electric Companies to those of 50 watts and smaller powers, of which practically every town of any consequence has its share. In fact the records of the Department of Commerce showed early this year the number of broadcast transmitting stations to be increasing at such a rapid rate that a serious congestion of the ether for wave-lengths in the immediate neighborhood of 360 meters would be inevitable unless means were devised for relieving the situation. To rectify the trouble it would manifestly be necessary either to discontinue the licensing of additional broadcasting stations, which in principle is contrary to the intentions of the Radio Laws, or to assign different wave-lengths to different broadcast services and to different sections of the country. The recommendations of Secretary of Commerce Hoover's Radio Committee, allocating such definite wave-length bands are already well known.

There is another method by which this congestion may be relieved, that of broadcasting by "wired-wireless" over existing electric lighting and power wires. This was suggested by Major-General George O. Squier, Chief Signal Officer, U. S. Army.

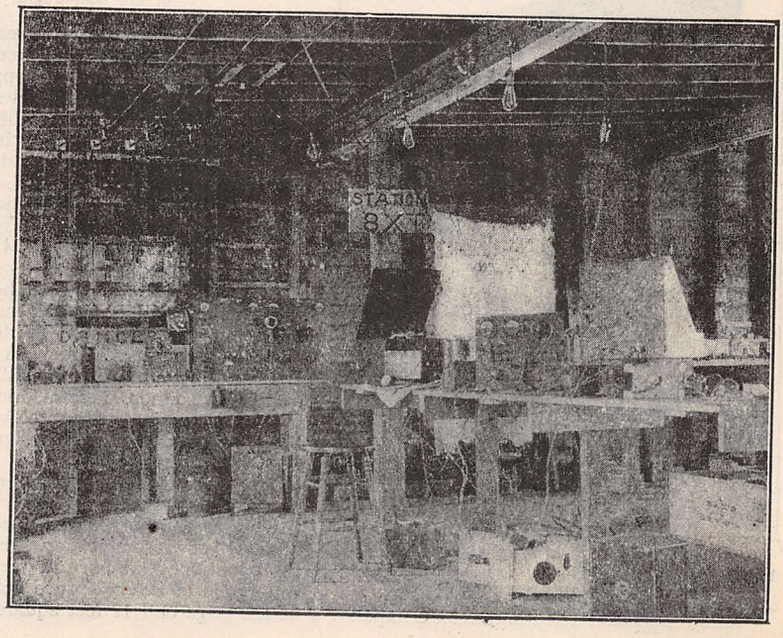
Wired-wireless, which is an invention of General Squier, fundamentally consists in the use of a system of conductors which connect the radio transmitting and receiving stations and to which the apparatus of the latter is connected, instead of utilizing the ether as with pure radio. Such a conductor system may be telephone or telegraph wires or an electric lighting network of a city. In other words, wired-wireless is a form of directed radio transmission, in which for the radio antennae at the transmitting and receiving stations is substituted connection to the electric light wire network. Due to the radio frequencies which are employed (above the limit audible to the ear) and to the small transmitting powers, there is no interference produced with the wire system by wired-wireless operation. Also, because of the tuning effect utilized in wired-wireless and, due to the extremely high reactances offered by such circuits to the telephone or power frequency currents, no interference in the reverse manner is produced. The great advantage of wired-wireless broadcasting is that, with the proper choice of wave-lengths the high frequency energy is not radiated into space in all directions, only a small portion of it reaching the desired recipient, but is directed and confined to flow along a definite plane directly into the customer's home. Such a system of broadcasting, aside from reducing radio interference, would effect a great conservation of energy and make possible the use of small transmitting powers.

During the months of March and April at General Squier's direction the writer, assisted by Messrs. Samuel Isler and C. E. Bohner, conducted a series of tests over the light wires of the War Department Building in Washington and, in co-operation with the Radio Section of the Bureau of Standards, over the 115-volt lines of the Potomac Electric Power Company in Chevy Chase, D. C. In these experiments both the transmitting and receiving apparatus were plugged directly into an ordinary light socket, as is done with an electric iron, toaster or other familiar electrical appliance. Both speech and music were successfully broadcasted into and received from the 115-volt lines.

The possibilities of such a system of broadcasting, when expanded on a large scale, were so apparent that a New York City corporation, which owns the public lighting utilities of a large number of cities throughout the country, offered the facilities of their systems to the Signal Corps for further experiment. In co-operation with this company and the Cleveland Electric Illuminating Company, during the month of May, very successful wired-wireless broadcasting was accomplished over the electric lighting wires of the latter company in Lakewood, a suburb of Cleveland, Ohio.

The method of distribution of electricity adopted in most cities where alternating current is used, consists in primary generation at the power-house at voltages ranging between 5,000 and 15,000 volts, three-phase, from whence it is distributed to the various sub-stations at this voltage, where it is transformed to between 2,000 and 3,000 volts, also three-phase, redistributed to the areas where service is purchased, again transformed down on the poles to approximately 115 volts single-phase and supplied to the consumers. In order, therefore, that broadcast service may be supplied to the maximum number of consumers with the minimum loss in intermediate connected power apparatus, the transmitting apparatus should operate into the 2,000 to 3,000-volt feeders. This would necessitate that the high frequency currents traverse the many distribution transformers scattered along the lines which step the voltage down to 115 volts, before it would reach the consumer. The question whether or not this could be accomplished without the aid of by-passing circuits was one of the most important to be determined.

The transmitter employed in the Cleveland experiments was a 50-watt type, comprising an oscillator, a modulator and speech amplifying tubes. Modulation was produced by action on the plate circuit of the oscillator tube through a transformer rather than a choke coil, as is ordinarily done. Connection to the high voltage lines was effected through protective mica condensers which also served to tune the line load, the latter being inductively coupled to



The Transmitting Station. Note on the Table in the Background the Phone Transmitter.

*Radio Engineer, The North American Company, New York.

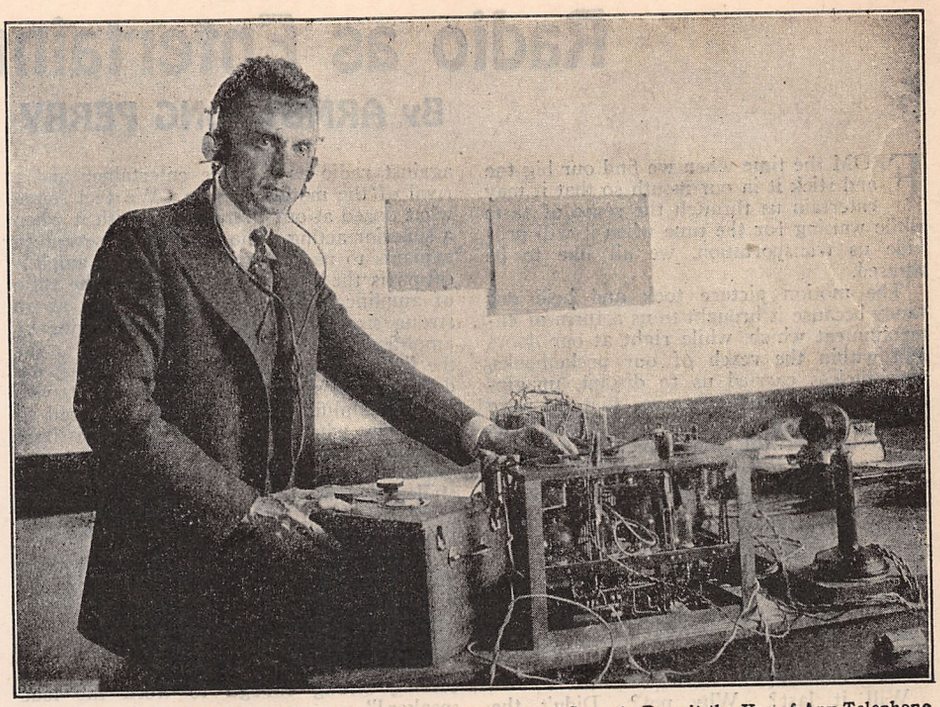
the oscillator circuit. A diagram showing the method of connections employed is given in Fig. 1.

The receiving apparatus consisted of an inductively coupled circuit tuner, a vacuum tube detector and a two-stage audio frequency amplifier. The receiving circuit throughout the experiments was maintained in the non-regenerative condition. The receiver connections are shown in Fig. 2.

A number of different methods of connecting the transmitting and receiving apparatus to the lines were tested. Those shown in Figs. 1 and 2 gave very successful results. In the former, connection is shown between only one of the three phases. Obviously the other two phases also contained distribution transformers through which it would be necessary to work to reach the consumers supplied. Experiments showed that so far as reception was concerned it did not seriously matter to which two of the three high voltage wires the transmitter connection was made. The receiving apparatus, it is noted, was connected between the two 115-volt lines and the ground, as this gave much more superior results to that in which the receiver is connected between the two lines. The receiver was either plugged into a lamp socket in the home or connected to the 115-volt lines on the pole, depending upon its particular location. Ground connection was made in the normal manner. The transmitter was located approximately 1½ miles from the Lakewood sub-station. Views of the transmitting apparatus and of one particular installation of the receiving apparatus are shown in Figs. 3 and 4 respectively.

An examination of the theory of wired-wireless energy propagation indicates that the attenuation or dissipation of the high frequency energy during its travel as well as the radiation into space from the lines, or "radio effect," should decrease with increasing wave-length. Low attenuation is desirable as it means smaller transmitting powers are required to cover given distances, while the reduction or complete elimination of the radio effect is the primary object of this method of broadcasting.

To investigate these combined features, five wave-lengths, viz., 350, 420, 710, 3,800 and 13,000 meters, were tested. Careful comparison was made on all wave-lengths between reception over the light wires and on an antenna. Of the five wave-lengths the three lower ones gave neither consistent nor dependable results when received at different points on the lines. Furthermore, there was considerable radiation since fair reception was obtained on an antenna located several miles from the transmitter. On 3,800 meters excellent reception was obtained over the electric lines and hardly observable reception on the antenna. On 13,000 meters the wired-wireless reception was not so good with about the same reception on the antenna. The latter results would indicate the existence of an optimum wave-length for the particular distribution system operated on, though time did not permit further investigation of this point.



Mr. R. D. Duncan, Jr., With a Special Apparatus He Designed So as to Permit the Use of Any Telephone Line for Secret Communication by Means of Wired-Wireless, Now Referred to as Line Radio.

In all, receiving tests were made in 17 different localities within the suburb of Lakewood, there being in some cases a number of repetitions of tests. The greatest air-line distance from the transmitter was approximately four miles; however, judging from the magnitude of the speech received at this point, this distance could have been materially increased. During the greater portion of the tests the receiving apparatus was connected to the 115-volt lines of the home, these in turn, through distribution transformers, connecting to feeders differing from those to which the transmitter was connected. This necessitated that the high frequency energy be transmitted back through the sub-station, out again on different feeders, through the step-down transformers and into the home containing the receiving apparatus. Probably the most striking test was that made in the Lakewood sub-station, where, practically surrounded by transformer banks, with a large rotary condenser operating within 20', and regulators operating every few seconds, practically perfect reception was obtained merely by plugging the receiving apparatus into the drop light above the operator's desk and grounding to the nearest pipe. When transmitting on 3,800 meters every test made within the Lakewood district yielded positive results.

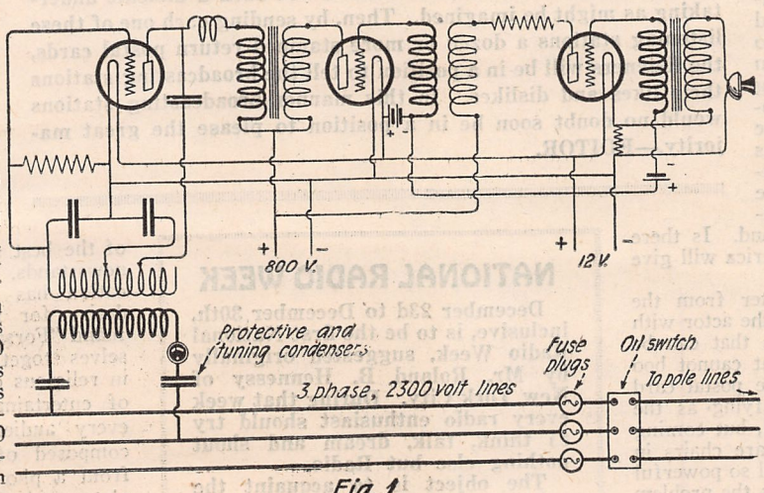


Fig. 1

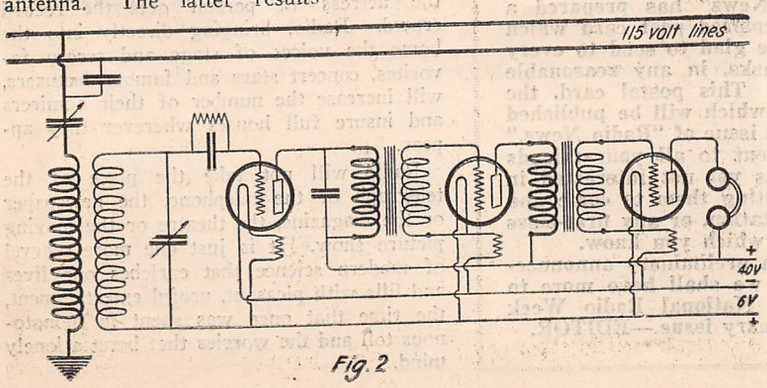


Fig. 2

These Diagrams Show the Connections of the Transmitting and Receiving Apparatus Used in Line Radio.

The Washington and Cleveland experiments, though admittedly few in number, indicate the feasibility of wired-wireless broadcasting. They further showed that with the proper choice of wave-length, no particular trouble may be anticipated from the power transformers and other similar apparatus at present connected to the distribution system, and what is most important, electro-magnetic radiation from the latter may be reduced to where it is not objectionable, still providing a system of broadcasting which will reach thousands of local consumers.

With this circuit no aerial would be required and no interference would be experienced, making this method a dependable means of disseminating useful information and entertainment as well.

A further advantage would be that only a relatively simple outfit would be necessary, the price of which would be accessible to the majority.

The writer wishes to acknowledge the interest and support shown in this investigation by Major-General George O. Squier; also the co-operation of The North American Company of New York City and The Cleveland Electric Illuminating Company.

Radio as Entertainment

By ARMSTRONG PERRY

FROM the time when we find our big toe and stick it in our mouth so that it may entertain us through the sense of taste while waiting for the time when it will provide us transportation, we all like to be amused.

The motion picture took and held our fancy because it brought to us a form of entertainment which, while right at our doors and within the reach of our pocketbooks, nevertheless carried us to distant, imaginary lands far from the cares that we were trying to escape. The movies even save us the trouble of thinking, which is more or less necessary, if one is to read. All we need to do is to look and the actors do the rest.

Radio, reaching us through our ears and promising in the not very far away future to spread distant scenes before us also, goes a step farther and for no expense at all, except a moderate first investment and a small upkeep, makes it possible to enjoy a show in night clothes, if we wish, instead of in evening clothes.

Will it last? Why not? Didn't the Apostle Paul twit the Athenians of always wanting to hear something new? Have not the folks of Athens, Ohio, and Athens, Pennsylvania, just as much curiosity as those who dwelt in ancient Greece? If you do not think so, go there.

Radio is primarily, of course, but a means of communication. No means of communication has as yet perished from the earth after it was once discovered. Men still carve messages on stone, as may be seen in any well-developed cemetery. They write them on skins, even on their own skins as the beauty spot and the tattooing parlor attest. Boy Scouts make marks on the ground and bend twigs to show the trail, though lead pencils have long been a household utility. Mothers blow horns to call their tardy sons home from the swimming hole. The printing press, the typewriter, the phonograph, the mailplane and the telegraph and telephone systems have but supplemented and increased the range of the more primitive methods for the exchange of thought and command. Is there any reason to believe that America will give up radio?

Radio, to look at the matter from the transmitting end, has supplied the actor with his heart's desire, an audience that can be increased *ad infinitum* and that cannot boo or hiss or throw turnips. The postal card applause is not quite as satisfying as the "hand" because longer delayed, but coming from more towns than there are chairs in the largest theatre it has a thrill so powerful that for the moment he forgets the problem of providing a box office and collecting the admission fees. Radio has given the politician what he has always wanted, an audience to which he can talk and talk and talk and which never heckles. To the minister it has brought the ineffable charm of wafting a spiritual message through a spiritual medium with the feeling that perhaps even the angels hear and approve his summons to a sinful world to put its house in order and prepare for the life to come. And, to return to the receiving end, it has given us all the chance to hang up on any one of them without in the least disturbing his flow of oratory, as we might if we stalked up the middle aisle. Are such advantages to be lightly cast aside?

There are certain things that militate against radio as a home entertainer and a rival of the motion picture. We feel somewhat dazed at our first contact with it when a superior acting radio amateur of seventeen explains to us that radio frequency amplification is the coming thing because the ratio of amplification is as great on weak as on strong signals, whereas in audio frequency amplification, meaning amplification after the incoming current has passed through the detector, the stronger the signal the stronger the amplification. What we wanted to know was whether we could get the fashion talks from Wanamaker's with a mahogany outfit. And after the thing is finally installed and we tune in, we get the current price of hogs in Kansas City when we want the household hints.

The male of the species sometimes takes the joy out of the radio evening at home by listening raptly for half an hour while the rest of the family look expectantly on, and then reporting: "Gee, I just got an act of a corking Broadway show but it was not coming strong enough to work the loud speaker!"

Batteries, like bank accounts, run low when to all external appearances they should be able to stand a strain. Vacuum tubes look so tantalizingly like the light bulb needed for the cellar stairs, but cost so scandalously when a single contact with the socket burns out the filament. The *dah d'dah d'dah* of a code station breaks into the "Song of India," or two songs get tangled like a pair of women pulling hair, on the evening when we are entertaining the Wednesday Club. And yet, radio lures us on, for there is always something new, and something new, be it what it may, is always interesting.

So far we have been passive listeners. We have taken the entertainment as it came, good, bad, or worse, just as we pull the prizes from the grab bag at the church festival. Like as not some of us have failed even to send the requested post card telling that we heard the show and liked it and that next time we would like so and so. In the future, I believe, we will have more to say about the programs. It took some time to get up courage to tell the moving picture manager whether we liked the feature or not. We used to leave him very much in the dark except when he was adept at reading the expressions on the faces of departing patrons or reached conclusions by comparing the box office receipts for certain pictures. When we took him into our confidence the quality of the photoplays began to improve and today the program of a neighborhood house is as accurately fitted to its clientèle as their shoes are to their feet.

So it will be with radio. There will be concerts such as we really want to hear, college courses for the boy who could not go as far as the university, business information in condensed form so that dad will not have to ruin his eyes and fill all his home time with reading. All will be systematized and on time like the visits of the postman. Probably we shall have individual receiving sets for the different members of the family, so each can hear what he wishes. They will be cheaper and more efficient than they are now, and simpler to operate.

What will become of the movies and of the theatres? is asked. Will radio take their place?

Have movies taken the place of reading? See the records of the best sellers, or look at the piled-up newsstands. No new system of communication has ever failed to stimulate the desire for more intercourse. The command "Forsake not the assembling of yourselves together" may have been needed in religious circles, but it is not in matters of entertainment. The larger part of every audience that greets a singer is composed of those who heard him first from a phonograph record. The moving picture draws, but the appearance of the actress in person gets the record crowd. Radio, bringing directly into the home the voices of stage and screen favorites, concert stars and famous lecturers, will increase the number of their admirers and insure full houses wherever they appear.

Radio will not take the place of the telegraph or the telephone, the newspaper or the magazine, the theatre or the moving picture show. It is just one more marvel of modern science that enriches our lives and fills with pleasant, useful entertainment, the time that once was spent in monotonous toil and the worries that beset a lonely mind.

IN this installment Mr. Perry makes some excellent suggestions. He compares the radio entertainment to the early movies, where we had to take what they gave us, and not what we wanted. Mr. Perry believes that in the future we shall have more to say about the programs that are being broadcasted than we have now.

An important thing that broadcasting stations should do at the present time is to ascertain the name of every radio listener within a radius of 25 miles. This is not such a difficult undertaking as might be imagined. Then, by sending each one of these listening stations a dozen or more stamped return postal cards, the listeners will be in a position to tell the broadcasting stations their likes and dislikes. In this manner broadcasting stations would no doubt soon be in a position to please the great majority.—EDITOR.

NATIONAL RADIO WEEK

December 23d to December 30th, inclusive, is to be the first National Radio Week, suggested originally by Mr. Roland B. Hennessy of New York City. During that week every radio enthusiast should try to think, talk, dream and shout nothing else but Radio.

The object is to acquaint the public at large with Radio.

"Radio News" has prepared a beautiful colored post card which we shall be glad to send to every one who asks, in any reasonable quantities. This postal card, the picture of which will be published in the next issue of "Radio News," is to be sent to all your friends who are as yet not interested in Radio, inviting them to come and see your station, or any first-class station of which you know.

This is a preliminary announcement, and we shall have more to say about National Radio Week in the January issue.—EDITOR.

Bank Opens Broadcasting Station

By O. S. SINDELL

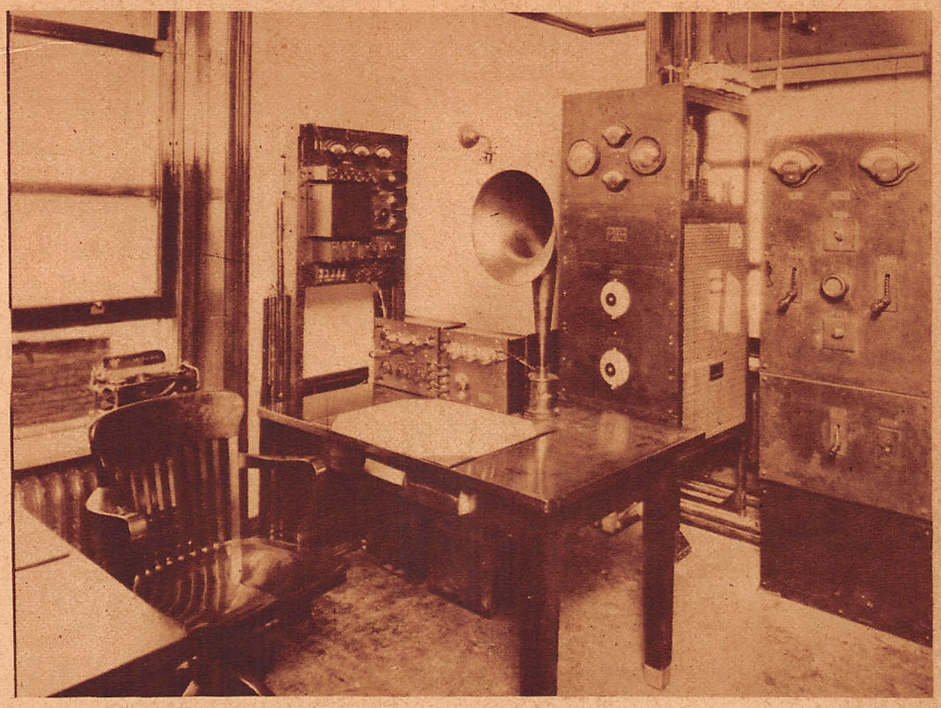
AUGUST 15th last marked the inauguration of Cleveland's newest and finest radio broadcasting station. This installation, by the Union Trust Company of that city, represents the very finest in radio broadcasting outfits and is easily one of the leading broadcasting stations in the country. The station employs a 500-watt transmitting outfit offering a radius of between 500 and 1,000 miles and is known as WAJX.

The new station will not only bring to the city dweller who owns a receiving set, but to the farmer as well, up-to-the-minute information on the major movements of the financial world, together with the vital news of all the markets. It will enable the farmer who does not himself own a receiving outfit to call up his local bank, which will have a receiving set, and obtain the very latest quotations on his farm and dairy products, insuring proper buying and selling upon the farmer's part. It will enable the city dweller within a wide radius of Cleveland to obtain the very latest news from the financial world.

In effect, the Union Trust radio broadcasting station will supply practically the entire Fourth Federal Reserve District with an up-to-the-minute, four-times-a-day, newspaper of the events of importance in the commercial and financial world.

It will enable the bank customer in the hundreds of cities surrounding Cleveland to be in four-times-a-day contact with the elaborate wire and information service at the command of the Union Trust Company, and it will make Cleveland the pivot for the latest thing in banking service.

Once a week, in the evening, from 7.00 to 8.00 o'clock, the very best entertainment program available in Cleveland will be broadcasted.



This Neat Radiophone Transmitter Was Installed Recently by a Bank in Cleveland, Ohio. It Is of the 500-Watt Type.

Mr. A. H. Scoville, for many years a leading figure among banking interests of Cleveland, says that radio broadcasting is unquestionably in its infancy.

"The average man," he says, "looks upon it as an easy means of listening to concerts, etc.

(*Continued on page* 1195)

More Comfort for the Flyer Passengers

Thanks to a Receiver and Loud Speaker Installed in One of the Coaches of the Pan American De Luxe Flyer, the Passengers Will Be Entertained During the Trip.

AS soon as tests now being made are completed, the South's first radio railroad coach will run regularly between Cincinnati and New Orleans as a part of the Pan American, de luxe flyer of the Louisville and Nashville railroad. The radio car in charge of R. R. Hobbs, superintendent of the telegraph system of the road, has just returned from a several-stop trip to New Orleans during which time successful tests were made.

When the radio feature is inaugurated in a few weeks, passengers on the Pan American, while they are being rushed across the country at a rate of 40 or 50 miles an hour, will be treated to concerts, lectures, reports on games and other entertainment not usually associated with a long trip by train.

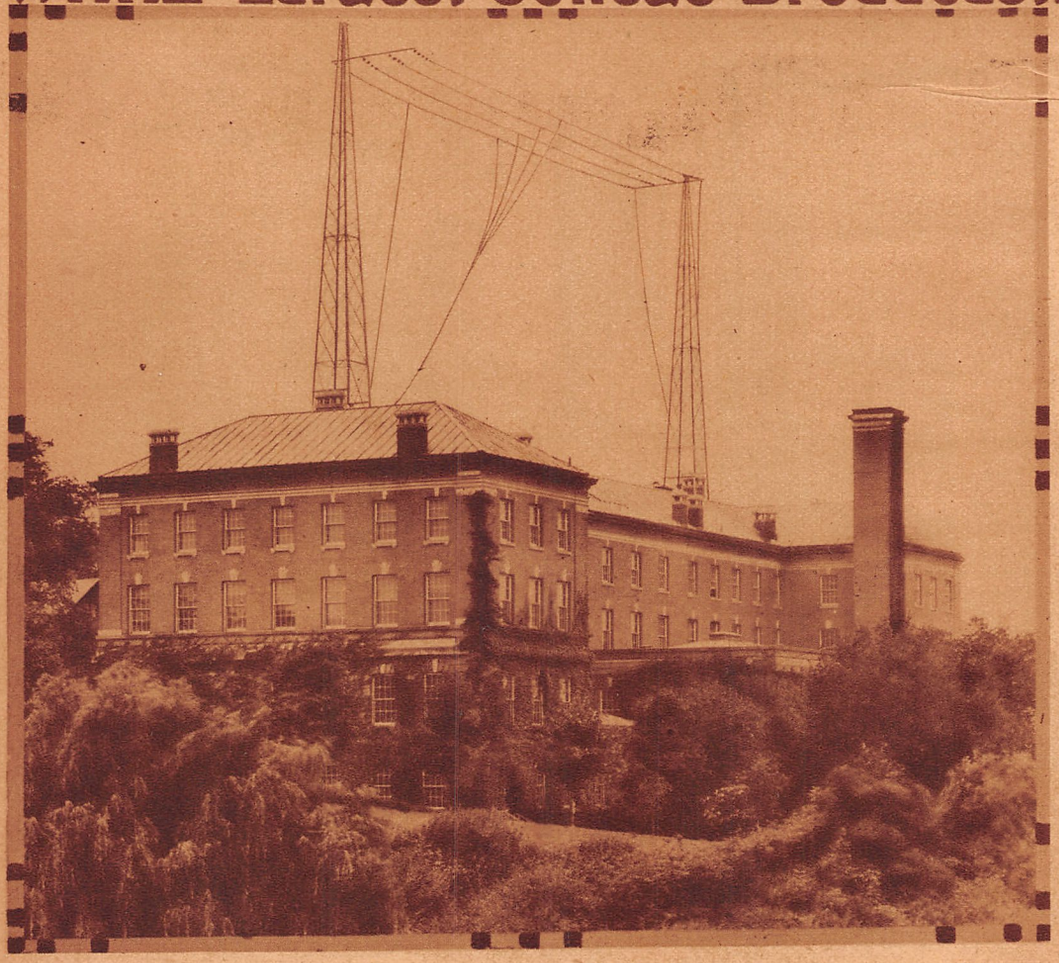
The radio car has an antenna of 13 wires strung along its entire length 18" above the top of the car. It is equipped with a Zenith Armstrong regenerative, using the feedback circuit and a two-stage amplifier, as well as a Western Electric power amplifier, together with a Western Electric loud speaker.

Stops were made by the radio car on its trial trip at Louisville, Nashville, Birmingham, Montgomery, Mobile and at New Orleans. Local broadcasting stations were picked up along the way as well as concerts from more distant points. The station of the Louisville *Courier Journal* could be heard through most of Kentucky, and in Tennessee the Atlanta *Journal* and a Baltimore station were picked up.

In Birmingham a special concert was given at the L. & N. station as broadcasted

(*Continued on page* 1196)

WHAZ-Largest College Broadcasting Station



In This Photograph of the Rensselaer Polytechnic Institute Can Be Seen the Aerial System of the Broadcasting Transmitter Recently Installed in the Electrical Engineering Department.

COINCIDENT with the opening of the college year a new and unique radio broadcasting station, officially listed in the Government call book as WHAZ, will be opened under the direction of the Electrical Engineering Department of the Rensselaer Polytechnic Institute at Troy, New York. This new broadcasting station is the most powerful in any educational institution in this country and has a range as great as any continental equipment so far established. In fact, there are only about half a dozen stations of such size and power in operation.

The equipment was installed during the summer months, under the supervision of the Professors and Instructors of the Department of Electrical Engineering, in the immense Russell Sage Laboratory.

The new Rensselaer Polytechnic Institute radio broadcasting station WHAZ will be unique in many respects. It is designed to deliver 500 watts of radio frequency power to the antenna system. To obtain ideal operating conditions a special suite of rooms has been prepared on the top floor of the big laboratory.

Adjoining the sending studio, but insulated and sound-proofed from it, is the large operating room, with radio sending and receiving apparatus and the power equipment required to supply the transmitting energy. The former apparatus includes the radio transmitter, the power panel, input amplifier panel and monitoring receiver, the antenna relay control and the radio receiving devices. The power supply is obtained from a three-unit motor generator set, consisting of one high voltage and one low voltage direct current generator, both directly connected to a driving motor of five and one-half horse power. In addition to the broadcasting equipment, the operating room contains a spark telegraph set and a continuous wave telegraph set of latest type. There are tables wired for experimental work in transmission and in receiving, and three separate transmitting and three receiving sets are arranged. By an elaborately worked out system of wiring and switches, with automatic controls and protecting devices, any of the individual sets may be switched on to the single elevated antenna system above the building.

(Continued on page 1119)

Canadian Broadcasting Stations

By CHARLES V. LOGWOOD

THERE would seem to be very little known of the chain of high power broadcasting stations that extends across Canada, from the east to the west coast, supplying Canadians with Canadian entertainment and news service.

The equipment for these five stations, designed by Dr. C. A. Culver, formerly of Beloit College, Wisconsin, was manufactured in Toronto, Ontario, and was installed by the writer.

These stations, four of which are already installed and have been in operation for some time, are briefly, "CFCA," operated in Toronto by the Toronto *Daily Star;* "CJCG," operated by the Manitoba *Free Press*, Winnipeg, Man.; "CKCK," operated by the *Leader*, Regina, Sask.; "CFAC," operated by the Calgary *Herald*, Calgary, Alta. The fifth high-power station is now ready to be installed in Vancouver, B. C.

The DeForest-Logwood capacity coupled circuits are used in these stations, which are rated 2 K. W. (including the power that lights the filaments). The condensers that are used in the equipment are "Dubilier" make, and are designed to withstand very heavy currents in the circuit, as well as the very high oscillating potentials. All constants are carefully calculated so as to conform to whatever wave-length the equipment is to operate on.

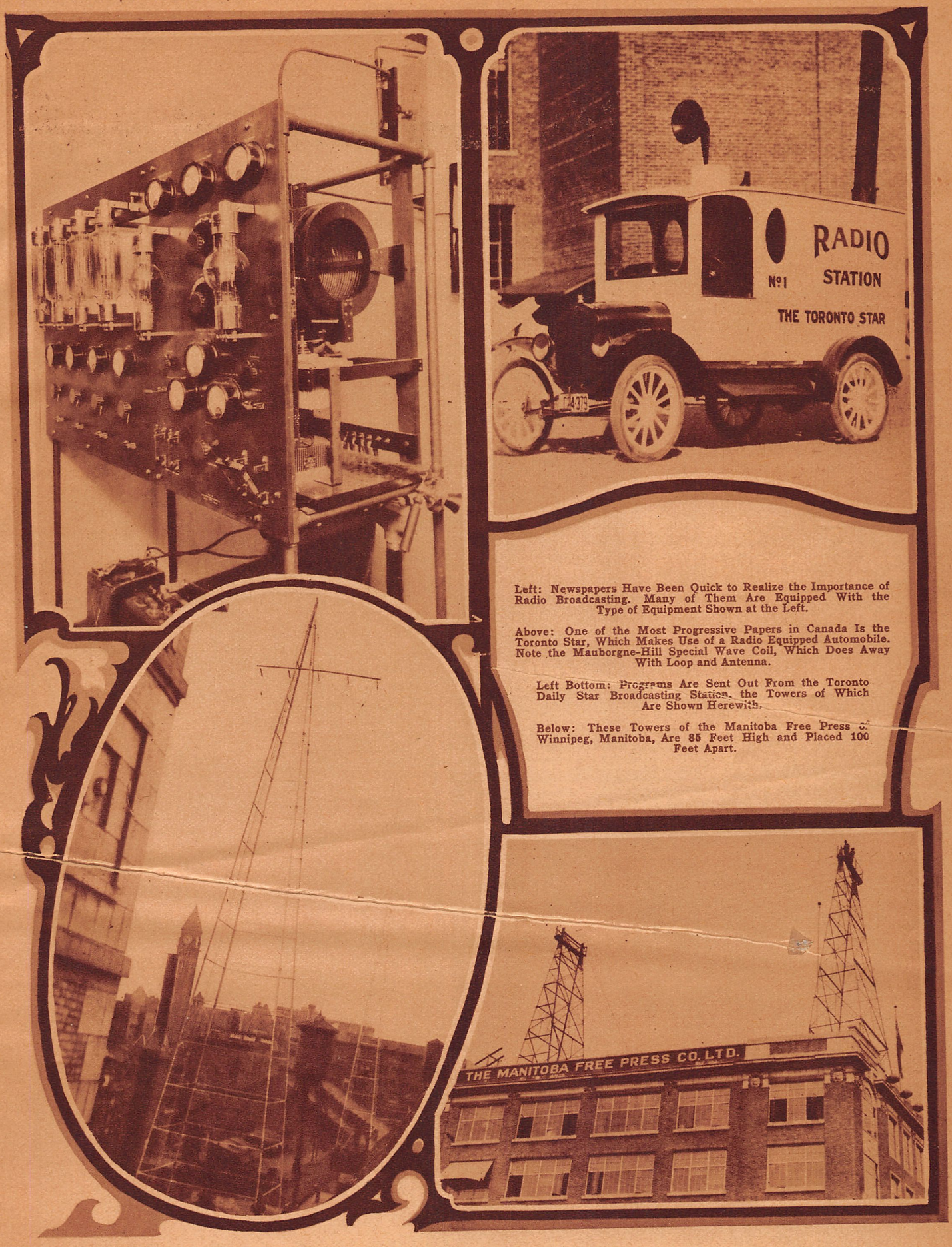
All choke coils are so arranged that they will absorb minimum energy from the oscillating circuits. Each choke coil in the D. C. circuit offers infinite impedence to the frequency that is choked back. Great care is exercised in getting the impedence right, for the safety of the power machines depends upon this very important factor. Honeycomb coils make excellent coils if they are treated with the proper varnish to keep out all moisture, otherwise they may cause very serious damage by allowing H. F. currents to pass on through the power circuit.

Special attention has been paid to the filters, both in plate and filament supply. It was found to be best to filter the filament supply so that any ripples that are present will not be detected in the receiver. It also prevents any high frequency currents from upsetting the counterpoise system. The latter precaution was very essential. With or without this choke, made considerable difference in the radiation, especially in the broadness of the wave.

The high frequency circuit is so arranged that the leads to the condensers and the helix are very short, especially the heavy current leads. Heavy copper bus bar carefully selected makes up the D. C. circuits. They are highly polished so that they will take a clear white lacquer, thereby making a good appearance.

The modulator is the most important part of the entire equipment. Briefly it is grid modulated by use of specially arranged connections. Modulator tubes are very necessary for its successful operation. It is claimed by a number of the leading radio engineers that grid modulation cannot be successful in high powered radio telephone equipment. The development of the method which is used in the Canadian radio telephone stations is indeed gratifying. Very deep modulation can be made with this system, and is clear and not distorted, no matter what sounds affect it.

The most satisfactory modulation is ob-



Left: Newspapers Have Been Quick to Realize the Importance of Radio Broadcasting. Many of Them Are Equipped With the Type of Equipment Shown at the Left.

Above: One of the Most Progressive Papers in Canada Is the Toronto Star, Which Makes Use of a Radio Equipped Automobile. Note the Mauborgne-Hill Special Wave Coil, Which Does Away With Loop and Antenna.

Left Bottom: Programs Are Sent Out From the Toronto Daily Star Broadcasting Station, the Towers of Which Are Shown Herewith.

Below: These Towers of the Manitoba Free Press of Winnipeg, Manitoba, Are 85 Feet High and Placed 100 Feet Apart.

tained when there is an excess of carrier wave. The percentage of modulation depends upon the intensity of the sound that strikes the diaphragm of the pick-up microphone. On certain musical instruments the modulation is much greater than others. Orchestral music gives an average modulation of about 50 per cent. Voices are usually about 80 per cent.

When these sets were finished and tested, they were shipped to the different cities, where they were installed and put in operation without any difficulty, and have been giving very satisfactory service. The inductances that make up the oscillating circuits were the only parts that were adjusted. All capacities were fixed at the factory and

(*Continued on page* 1114)

His Mistress' Voice

By GOLDA M. GOLDMAN

THE dog who has listened so faithfully all these years to the sound of "his master's voice" as it came to him on a phonograph record must be sadly confused these days by the varied voices issuing forth from the radiophone amplifier. Not the least of his troubles, I should think, would arise from the fact that in many cases what he hears is his mistress' voice!

The position of announcer at a broadcasting station is rather a more complex matter than would appear on the surface. The most obvious feature consists of saying at intervals into the microphone:

"This is Announcer ABC of broadcasting station XYZ. The next musical offering, played by the Saxophone Club of Weehawken, will be the Gin Gin Ginny Shore."

The only quality necessary for that particular phase of the work is a carrying voice of pleasant quality, and a clear enunciation. But the announcer is also in many cases the man who goes out and interviews the celebrities and persuades them to donate their services for the edification of the radio fans. He should be musically inclined and if possible have talent of one sort or another in order to establish a bond of sympathy between himself and the artist. He should possess a ready intelligence and some education so as to appreciate the relative importance of the various lectures which are offered him. He must be adept at planning the programs on occasion, and be able to provide substitutes readily when promised talent disappoints him. But the prime requisites, without which the value of the others is lost, are tact and a pleasing personality. Mr. Announcer is the man most frequently in touch with the fans. They must welcome his voice and be glad to communicate with him concerning their apparatus and his programs. Besides this, he is

(*Continued on page* 1100)

Miss Helen M. Hann, Who Is an Announcer at WBAY, Has It All Over Miss Koewing, Shown Below. She Works in a Studio Which Was Decorated and Furnished by Her.

WOR Claims the First Woman Announcer, However, in the Person of Miss Jessie E. Koewing, Whose Popularity With the Fans Began Several Months Ago.

Even the Most Professional of Radio Fans Admit That Miss Gwendolen Wagner, of Station WPO, Shown on the Left, Has a Good "Sending" Voice. She is the Only Woman Broadcaster of the South.

Radio on the Run

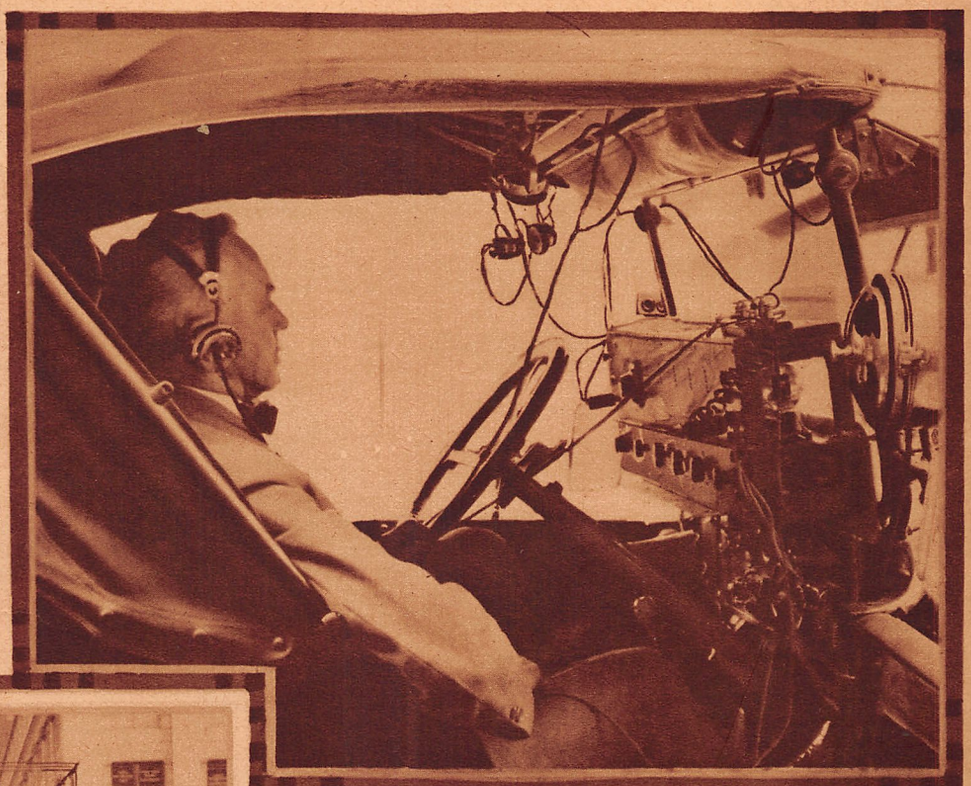
An Interview with Mrs. J. C. DAVENPORT

A RADIO set on an automobile is sure to draw a crowd, especially if the crowd learns that the car has already traveled 40,000 miles and is on the second lap.

Recently an automobile with a loop aerial in front of the wind screen and a receiving set on the dashboard made its appearance in the streets of New York. Crowds gathered wherever it stopped and listened to the music of the broadcasting stations. Mr. and Mrs. J. C. Davenport, owners of the car, were testing out their new radio set, known as the "Dashboard Special." They had just completed a 40,000-mile tour and were about to leave on a second tour of indefinite duration. On this new tour they will keep in touch with the rest of the world by radio and demonstrate the possibilities of radio in every city, town and hamlet through which they pass.

"Forty thousand miles by automobile haven't cured us of gypsying," said Mrs. Davenport, in response to an invitation to tell of her experiences.

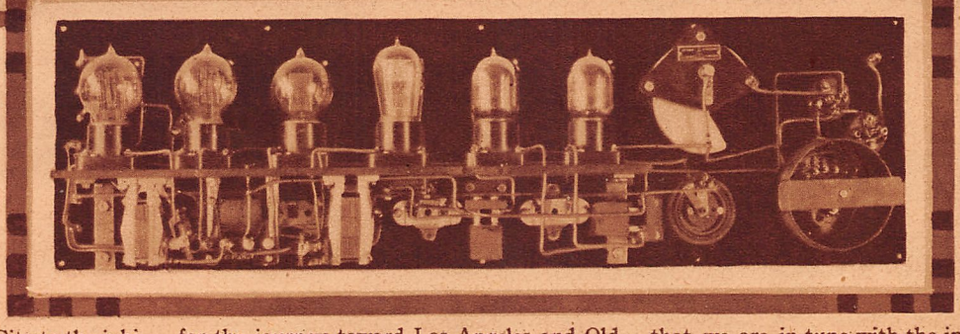
"We are now leaving New York City to follow the old trail again, the trail we first took October 1, 1920. And this time we are taking with us a marvel of science which will be a link with civilization even in the midst of deserts or the tops of high mountains—a radio set.



Above: Listening to Broadcast Music While Traveling Is the Novel Sport Indulged in by Mr. and Mrs. Davenport. Here Is How the Set Is Mounted on the Dashboard.

To Left: The Loop Which Picks Up the Signals, and the Loud Speaker Which Makes Them Audible to the Audience Are Both Mounted Forward on the Hood.

Below: This Is the "Dashboard Special" Designed for This Trip by the Radio Guild. It Fits the Dashboard of the Car Accurately.

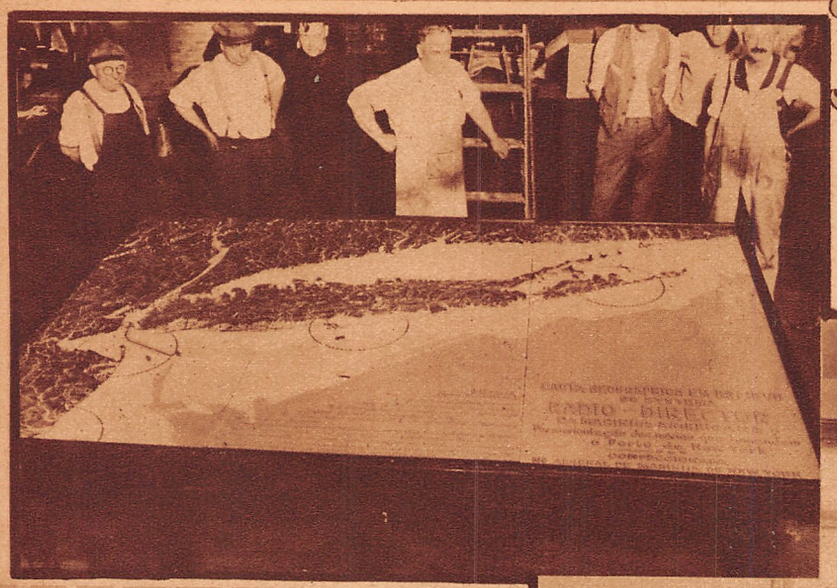


"We will travel first through the South, visiting Miami and other Florida towns, and from there we will sail to Cuba and the West Indies. I wonder if they have broadcasting stations there? After this visit, we will take the Argonauts' trail to the West. We'll speed along the wonderful Lincoln Highway to Denver and Salt Lake City to the jubilant strains of our Dashboard Special; then we'll hope for a more pensive tune as we take the Oregon Old Trails to Portland and Seattle. The Puget Sound country will be our next site, and after that south through Washington and Oregon to California. The San Francisco bay section is a veritable nest of broadcasting stations, I have heard, and we'll be able to 'pick and choose' our music for the journey toward Los Angeles and Old Mexico. On our last trip we attended a bull fight in Mexico, and this time we'll repeat the visit and incidentally we may take away the bull's audience by giving a concert, if there is any Mexican music about on American wave-length. Oh dear, they say 'Music hath charms'—hope the bull won't be part of the audience.

"I am curious to hear music when we cross the Salton Sea, which is 267' below sea level. And the Mohave Desert—we'll put up our portable aerial there and surely we will feel that we are in tune with the infinite. Then we'll go up to the mountains till, at the Great Divide, we attain our greatest altitude, 14,500' above sea level. Then back again through the fruitful Middle West and up to the New England States. After that—well, Mr. Davenport and I waited over 30 years for this honeymoon trip and I don't think that either of us will be in a hur y to

(*Continued on page* 1116)

Radio News in Pictures

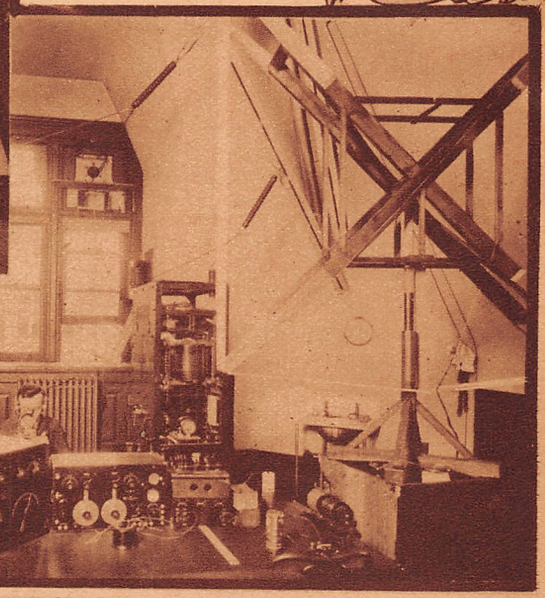


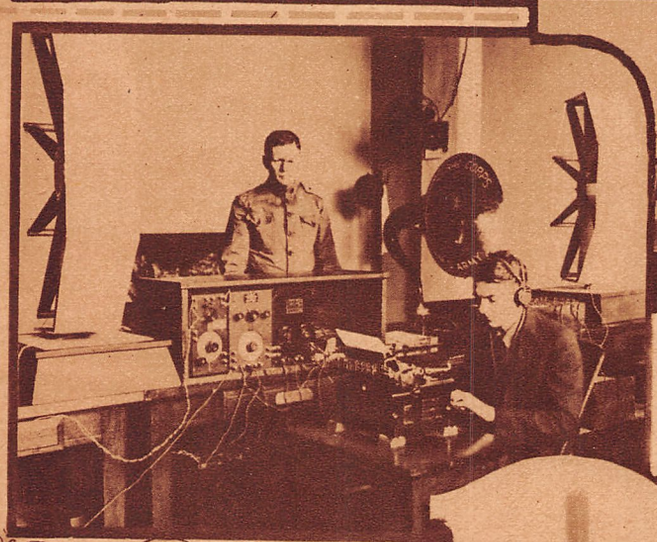
At Left: In the Navy Yard at Brooklyn, N. Y., There is a Model Radio Relief Map of New York and Long Island. Radio Compasses Locate and Register Every Movement of Small Model Ships Equipped With Radio Control.

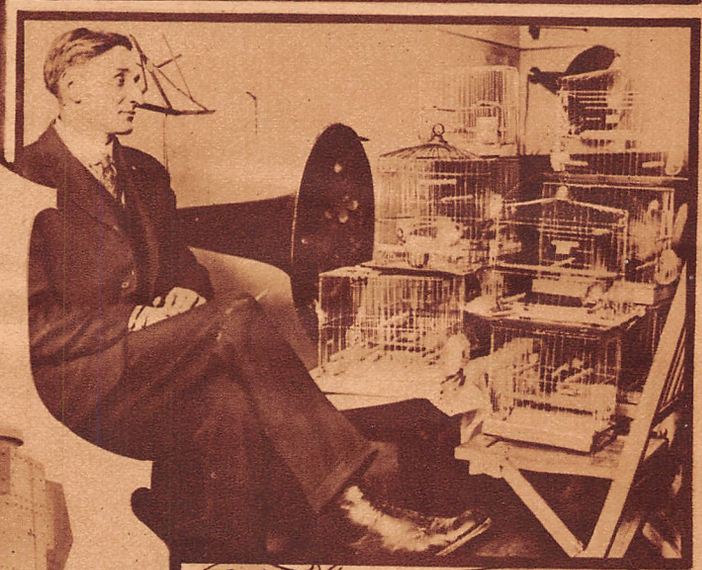
©International.

Below: Farmers Need Not Know the Code to Receive the Crop and Market Reports. The U. S. Post Office Department Abandoned Radio Telegraphy in Favor of Radio Telephony for Such Service.

©Harris and Ewing.

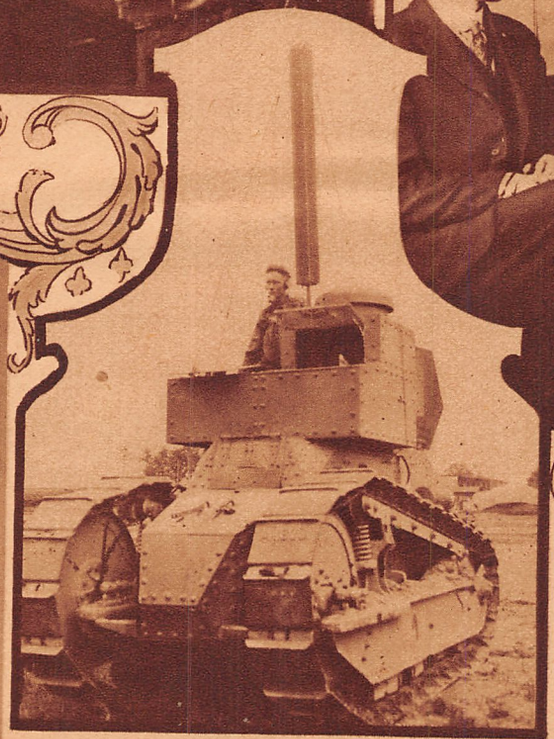






Above: European Stations Are Received on These Loops at the Signal Corps Station in Washington, D. C. This Is the Laboratory in Which Brigadier General Squier Conducts Most of His Experiments.

©Fotograms, N. Y.



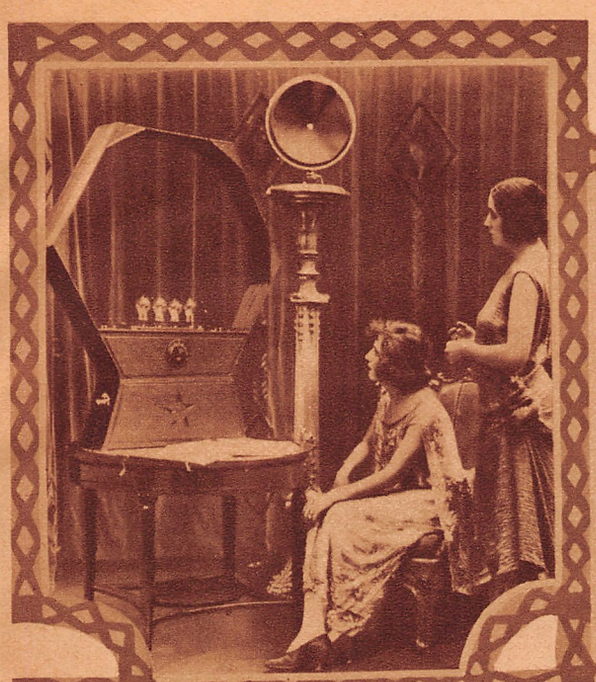
Above: Trained Roller Canaries Supplied the Entertainment at a Recent Radio Concert Given in San Francisco. Professor A. H. Hazlett of Berkeley "Directed" This Unusual and Delightful Concert.

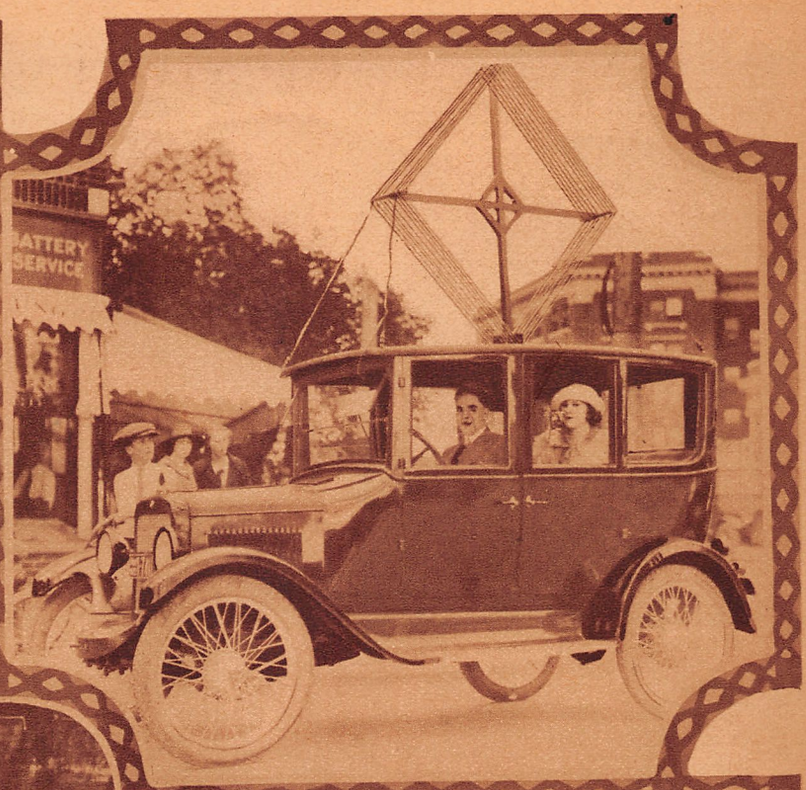
©International.

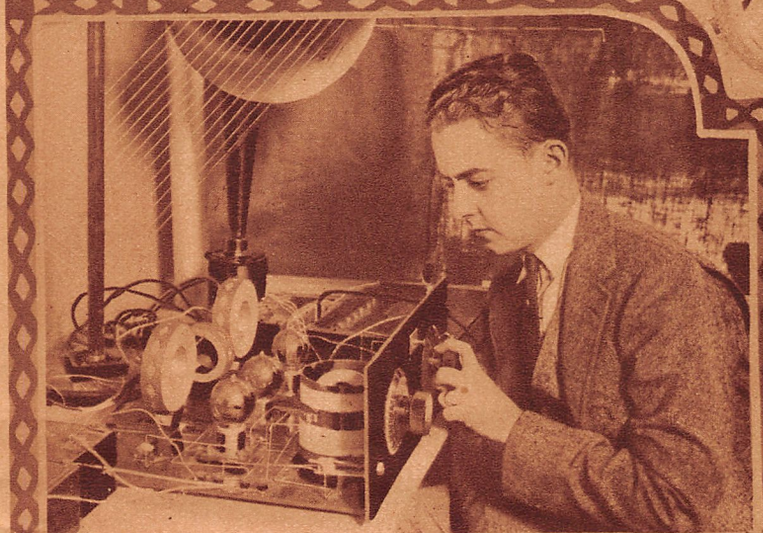
At Left: A "Baby" Tank, Equipped With Radio, is the Newest Instrument of Warfare. The Tanks Are Not Armed, But are Used as a Medium of Communication Between the Front Line and Headquarters. The Special Aerial is Placed on Top of the Tank, Which is Manned by a Driver, and a Radio Operator.

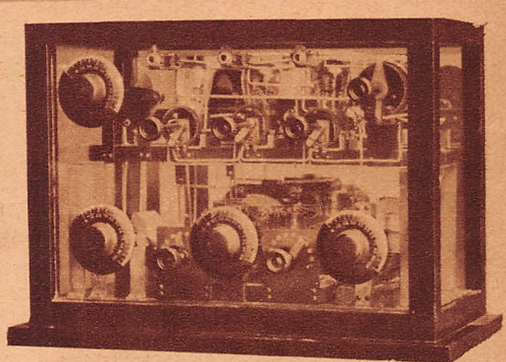
©International.

Radio at Home and Abroad





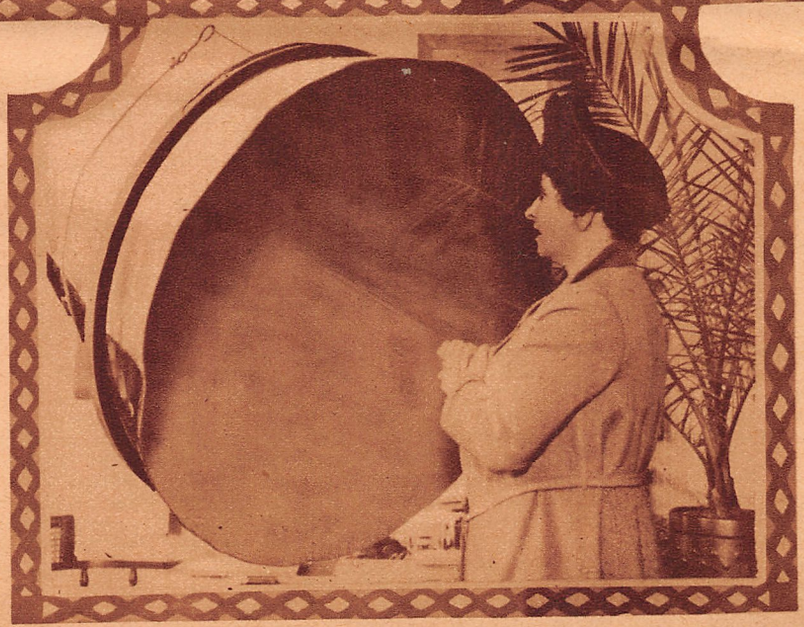




Above: The First Radio-Equipped Automobile That Strolled Down the Streets of Winnipeg, Canada, Caused Quite a Lot of Interest. Not Only Because It Was Radio-Equipped, But Because Miss Louise Lovely, the Moving Picture Star, Was Riding Within. The Set Was Placed in the Automobile by Mr. L. V. Salton, and Has Received Signals Over a Distance of 75 Miles.

Below: Glass, Besides Furnishing Excellent Material to Make a Panel With, Also Affords a View of the "Insides" of a Radio Receiver. Mr. T. F. Krumm, of Continental, Ohio, Had to Be Very Neat in Wiring This Set, as Can Be Seen from the Photograph.

To the Right: It Was a Rather Peculiar Horn Which Mrs. Lily Payling, Well-Known Australian Contralto, Had to Sing Into, When She Broadcasted from Station PCGG Some Time Ago.



Above: When Madame Goes Shopping in the Fashionable Paris Maisons, She Can Take a Rest Between Trips, and Listen to Concerts in Her Favorite Shop. Here Is the Set Which Welly Soeurs, Famous Paris Couturieres, Have Installed for the Amusement of Patrons and Mannequins.

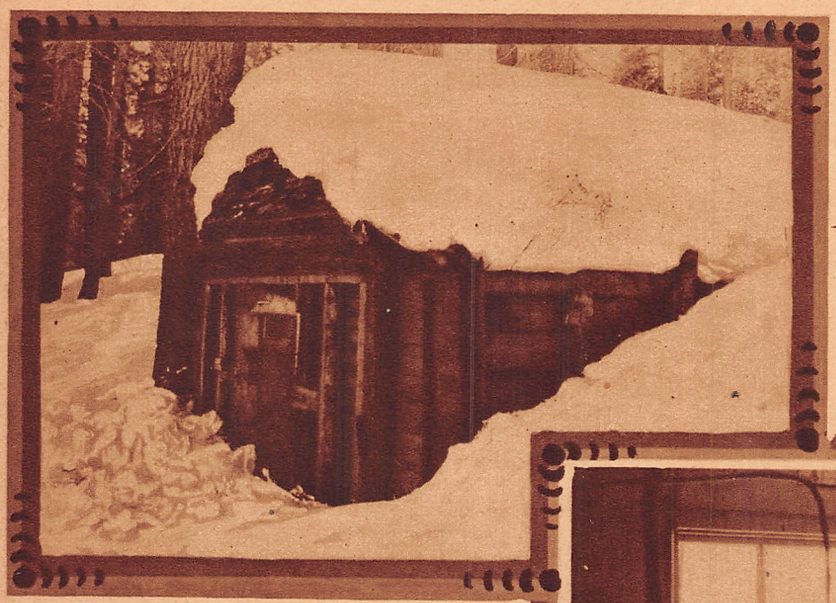
©Kadel and Herbert.

Below: It Is a Difficult Stunt to Eliminate the "Whistle" Which Is Present in Most Armstrong "Super-Regenerative" Receivers. Mr. Rutledge R. Mayo of New York Succeeded in Overcoming This With a Specially Made Coupler and a Slight Modification of the Hook-Up.

©Kadel and Herbert.

Radio in the Wilds

By CHARLES HESTON PEIRSON



It Is Easy to Imagine How Useful a Radio Set Is to the People Who Live All Winter Long in the Snow, Blocked and Without Other Means of Communication.

The Radiophone Station Installed by the Southern California Edison Co. to Keep in Touch With the 500 Men Working on a Tunnel in the Mountains.

IN the dizzy altitudes of the high Sierra Madre Mountains of Fresno County, California, radio will be used this winter to direct the activities of 500 men who will go into camp behind 300 miles of impassable snowdrifts to push forward during the winter the greatest piece of tunnel construction now in progress on the Western Hemisphere. This tunnel is a part of the gigantic hydroelectric development project of the Southern California Edison Company, which is carrying on a program for the development of a million and a quarter horsepower of water-power electricity derived from the San Joaquin River and Big Creek and other mountain torrents. One magnificent mountain lake, over seven miles long, has been impounded, and the program includes the impounding of water which will add three more mountain lakes to the chain which will be connected by the Florence Lake tunnel and a tunnel from Huntington Lake to Shaver Lake.

This winter, over 5,000 men will be on the job, including the 500 who will be marooned on the upper end of the long tunnel over the crest of the Kaiser Range. The direction of the marooned men will be entirely given by radio from the headquarters of the resident engineer at Cascada, the construction headquarters; much of the other work will be done under radio communication.

The success of radio was so thoroughly demonstrated during last winter, not only in directing the work of the men who were beyond wire communication, but in picking up and carrying on communication with the general offices of the Southern California Edison Company in Los Angeles, a distance of 270 miles from the outposts of operation, that facilities have been greatly improved in preparation for this winter's work and new and expensive apparatus put into service.

Due to conditions during the winter when snow and sleet storms are prevalent, it was found the telephone lines did not give reliable service. Therefore, the radio communication was decided upon and has proven satisfactory. There are now three combined radio telegraph and telephone stations in operation and one more radio telegraph is being installed. The headquarters station at Cascada is at an elevation of 5,000′, in a canyon approximately 2,000′ deep, with abrupt walls on three sides. The second station is located at a construction camp on the shore of Florence Lake, which is the south portal of the great Florence Lake tunnel, at an elevation of 7,000′ and about seven and one-half miles in an airline northeast of Cascada. The third is located at a construction entrance camp, over the Kaiser Range, which is about eight miles in an airline north of the south portal on Huntington Lake. This station is only about 300′ higher than the portal station, but there is a mountain pass about 2,000′ high between them.

The construction entrance camp is at an altitude of over 9,000′. Due to the location of the stations and the topography of the country, and the fact that little was known regarding radio communication in a mountainous territory, it was necessary to do considerable experimenting before satisfactory results were obtained. Portable radio telephone sets which had given satisfactory service in the vicinity of Los Angeles were first taken into this territory. Tests showed that to communicate a certain distance it was necessary to use about 25 times more power than was needed near Los Angeles.

The three transmitters rated at ½ kilowatt were built on special order in about 12 days. One oscillation tube is used in each set. They were designed originally for continuous-wave telegraphy, but have been equipped for the telephone or buzzer modulated telegraph. All three work well.

To furnish power for the boring of tunnels for the hydraulic development, a 30-kilowatt volt transmission line has been built between Cascada and the two outpost mountain camps. The radio sets give a rapid and reliable means of communication during transmission line trouble and handle switching and operating line orders. The transmitter at Cascada obtains its filament current from the 110-volt supply and plate current from a 1,500-volt generator belt driven by a two-horsepower induction motor. The radio power plant at Huntington Lake portal camp and the construction entrance camp consists of a 220-volt three-phase motor, coupled to a 32-volt D.C. generator and belted to a 1,500-volt direct current generator from the coupling. Under normal operation the 32-volt direct current generator furnishes power for the filament and the 1,500-volt direct current supplies the plate. During a failure of the 30-volt transmission line, the 32-volt direct current generator operates as a motor from the storage batteries of the mine locomotives used in the tunnel work.

The antenna at Cascada is of the inverted L type, 140′ high at the free end, 90′ at the station end, and 120′ between spreaders. Five No. 8 copper wires spaced 4′ apart are used. At Florence Lake portal camp a T aerial is installed, being 140′ high and having 175′ between spreaders. The same wire and dimensions are used. The construction entrance camp has a T aerial 90′ high with 150′ between spreaders. The radiation from each of these antennae is about 2.4 amperes at 540 meters, which is the normal operating wave-length.

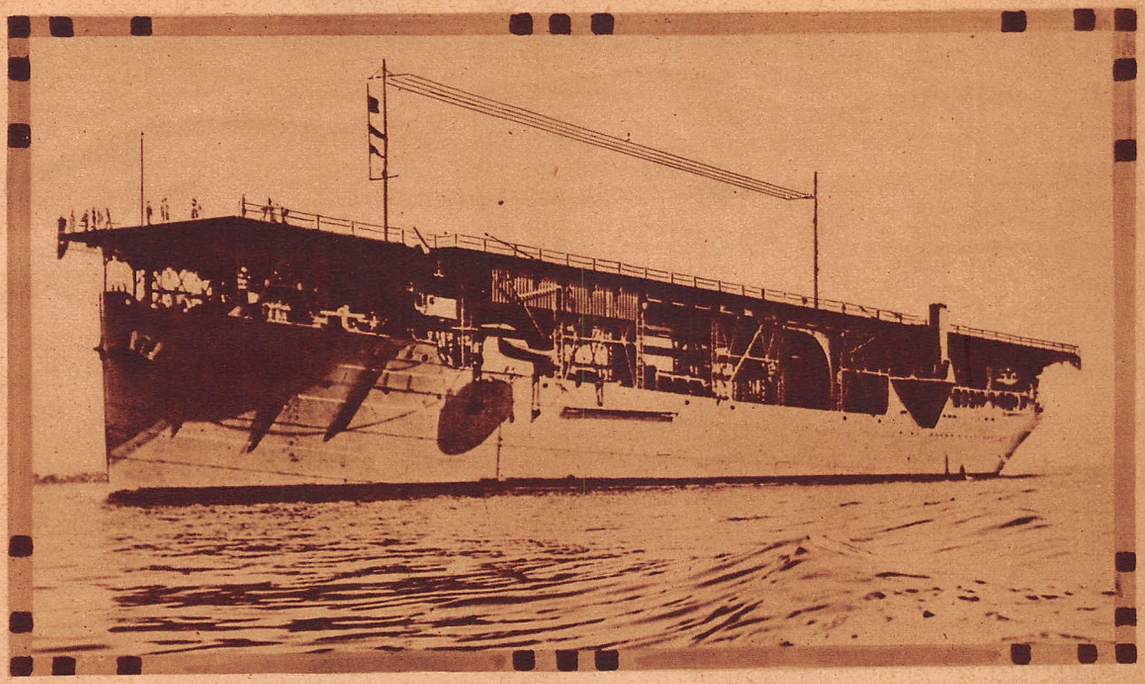
Involved in the work of developing the full electric potentiality of the streams of the high Sierras and conserving their flow for irrigating lands in the San Joaquin valley are many more daring engineering problems, which will necessitate the drilling of other tunnels, the erection of enormous storage dams in the mountain ranges and far beyond lines of transportation and the constant employment of thousands of men for several years to come. Radio is probably being put and will continue to be put to one of its most practical uses in becoming the medium for transmitting the instructions for the work in this great project.

Radio to Play Important Role on New Aircraft Carrier Langley

By CARL H. BUTMAN

THERE is a strange Naval craft cruising in Chesapeake Bay. She looks something like a marine dance hall, as her upper deck is broad and flat, and unobstructed. She does not carry the usual masts and funnels; no aerials are visible, yet this curious ship answers to the radio call NNC, designated in Naval radio or signal language as "Nan Nan Cast." Being mastless, one wonders about her aerials, but there are both permanent and adjustable aerials and radio masts which can be raised or lowered at will. She is also equipped with much new and novel radio apparatus.

Although not a Flying Dutchman, she carries a number of flyers and many kinds of flying craft; she is really a home for Flying Seamen.



The U. S. S. Langley Is the First Airplane Carrier to Be Commissioned in the U. S. Navy. It Will Carry on Experiments in Connection With Aircrafts in Chesapeake Bay and Vicinity.

(Official photo U. S. Navy by U. & U.)

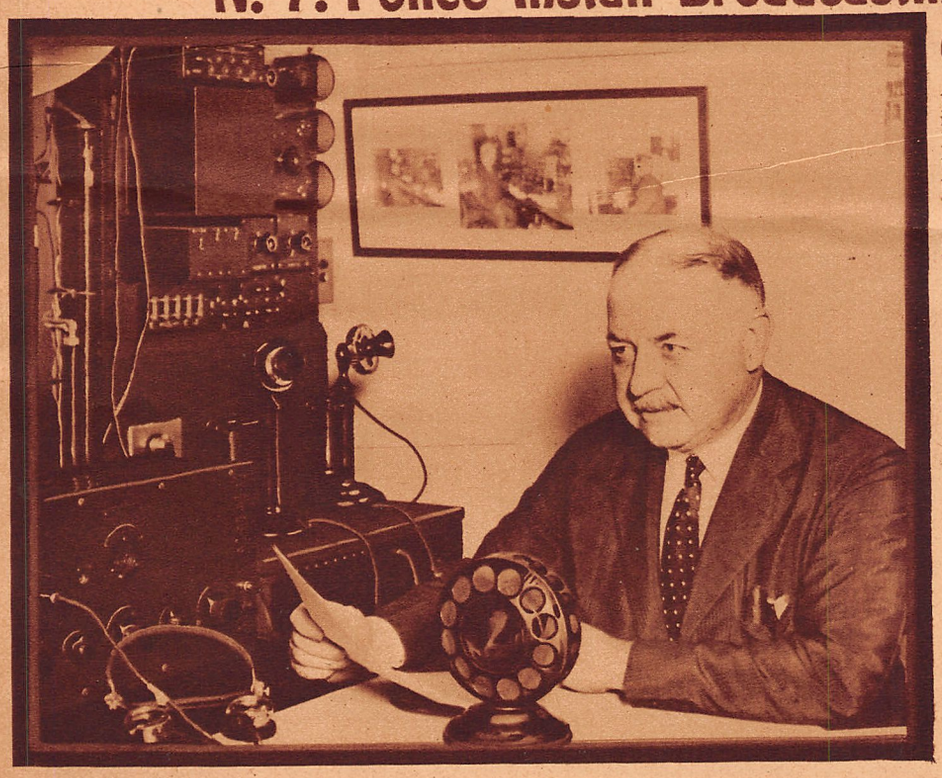
The vessel is the newly commissioned Aircraft Carrier *Langley*, built out of the hull of the old Collier *Jupiter*, the first Naval vessel to be equipped with electric drive. She is now making her "shake-down" or trial cruise in Chesapeake Bay under command of Captain S. A. R. Doyle, U. S. N.

The *Langley*, named after the scientist who was the first practical student of aeronautics and mechanical flight, is a veritable floating landing field and mother ship for air and sea planes, but at the same time she is a sea-going radio laboratory for the study and development of radio communication between aircraft and ships.

Her great flying deck, which stretches for 520′ from stem to stern and is 65′ wide, prevents the erection of permanent masts for radio or other purposes—her "top sides" must be clear for the launching and landing of her aircraft. Special telescopic masts have

(*Continued on page* 1104)

N. Y. Police Install Broadcasting Station



Mr. Joseph A. Faurot, the Famous Finger Print Expert, and Commissioner in Charge of the N. Y. Police Department, at the First Broadcasting Station Exclusively Devoted to Police Purposes.

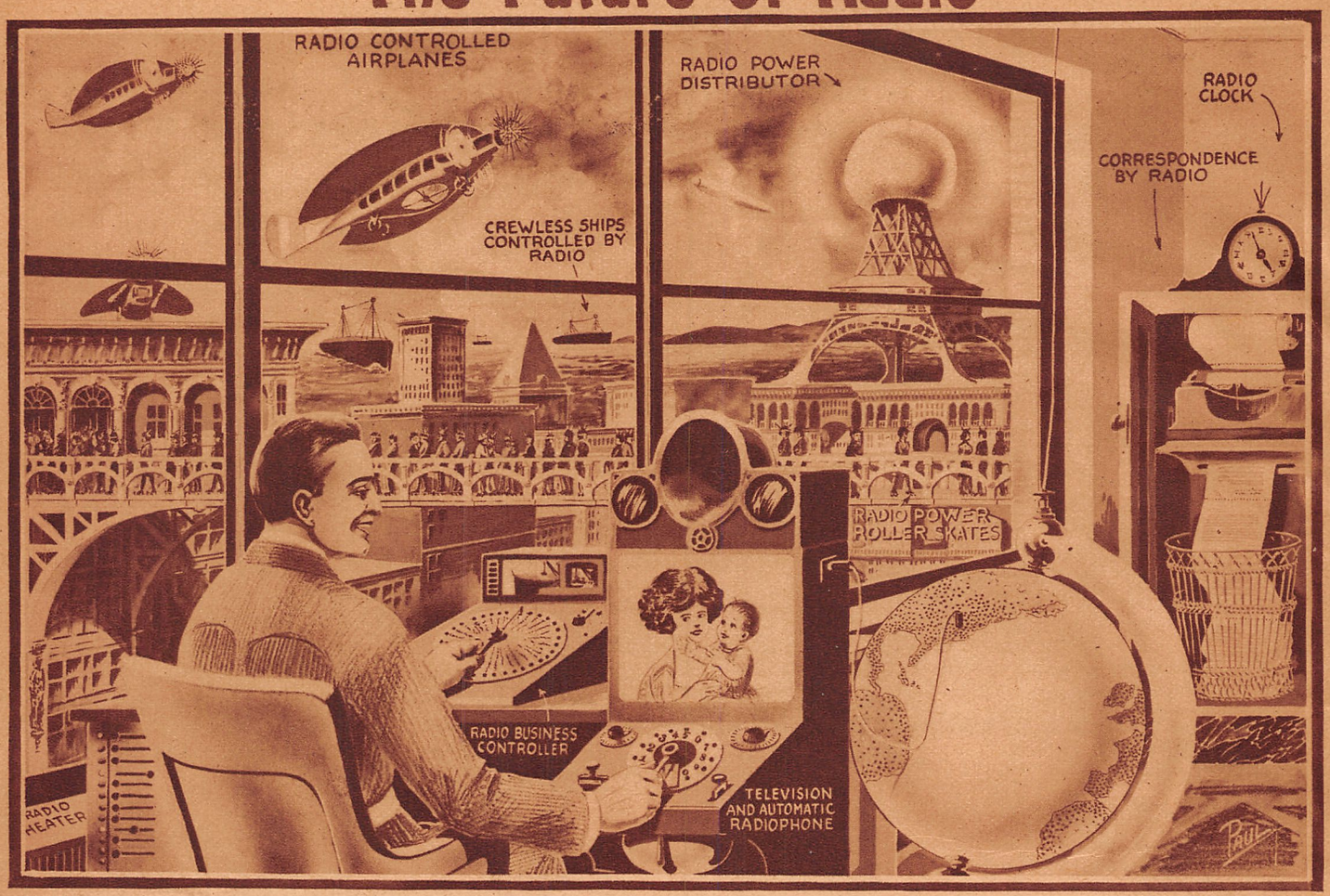
ONCE again New York's "finest" have set the example for the other police departments of the globe. Awakened to the possibilities of radio telephony as a factor in the suppression of crime, the New York Police Department has installed at headquarters at Center street the first broadcasting station ever used exclusively for police purposes. The apparatus, which was manufactured by the Western Electric Company, is of the same general aspect as that by which communication was carried on early this year between Deal Beach, New Jersey, and the S.S. *America*, far out on the Atlantic.

Joseph A. Faurot, the famous finger print pioneer and deputy commissioner in charge of the New York police executive departments, is enthusiastic over the results already obtained with the apparatus. "If what Mr. Evans, the Western Electric engineer who is instructing our operators in the use of the equipment, states is true," Mr. Faurot said, "the New York Police Department will be able without any difficulty to cover an area of at least 30,000 square miles about this station. This should prove a great aid to us in running down stolen automobiles, locating missing persons, spreading alarms, and in all other work where secrecy is not an essential factor. Every amateur receiving station in a radius of at least 100 miles from the city will become a sort of police outpost, enabling us to spread emergency information at a much quicker rate than is now possible.

"Later as our men gain more experience

(*Continued on page* 1110)

The Future of Radio



In This Picture Are Shown a Few of the Future Inventions Made Possible by Radio, Which Will at the Time Be Highly Developed. We May Expect to See Within a Few Years Some of the Novelties Here Shown. The Teletypewriter Is Already in Use and Television Is Not Far Off. The Transmission of Power by Radio Is Also a Possibility, According to Nikola Tesla. What Wonders Are to Come No One Can Predict, for 25 Years Ago Nobody Would Have Thought Possible Things Which Are Common Today.

(The accompanying illustration is the frontispiece of Mr. H. Gernsback's book, "Radio for All," now being published by J. B. Lippincott Co., Washington Square, Philadelphia, Pa., to whom we are indebted for the use of the drawing.)

IN this illustration are shown some of the future wonders of radio. Several of the ideas are already in use, in an experimental way, and it should not be thought that the entire conception is fantastic.

The illustration shows a business man, let us say, fifty years hence. To the right is a television and automatic radiophone. By means of the plug shown to the right of the machine, the man can plug in any city in the United States he desires; then, by means of this automatic control board he can select any number in that city he wishes, merely by consulting his automatic telephone directory. As soon as he has obtained his number, a connection is made automatically and he not only can talk, but he can see the party whom he calls. At the top of the instrument is a loud-talker which projects the voices of the people, while on a ground-glass in front of him the distant party is made visible. This idea is already in use, experimentally.

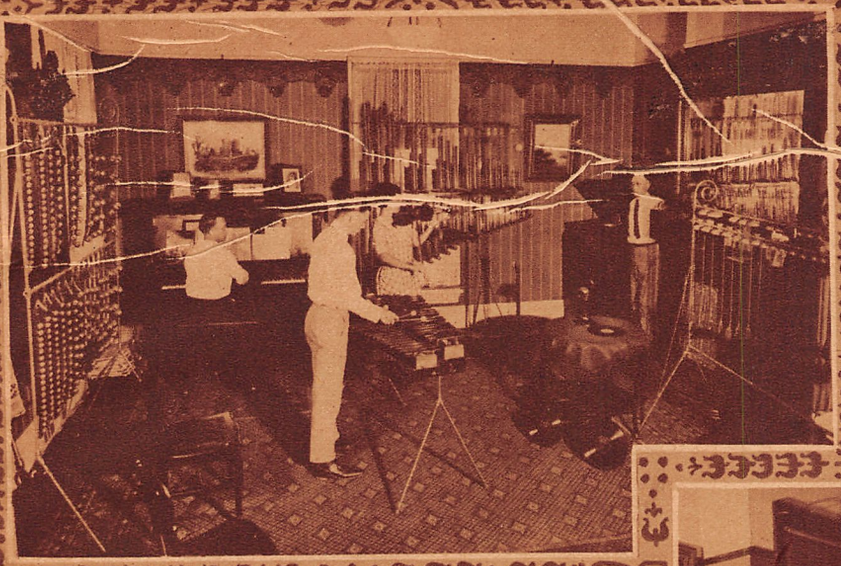
Directly in front of the man, we see the "radio business control." By means of another television scheme, right in back of the dial, the man, if he chooses to do so, can load and unload a steamer, all by radio telemechanics, or throw a distant switch, or if a storm comes up, look into the interior of his apartment and then, merely by pressing a key, close down the windows; all of which can be accomplished by radio telemechanics, a science already well known.

(Continued on page 1184)

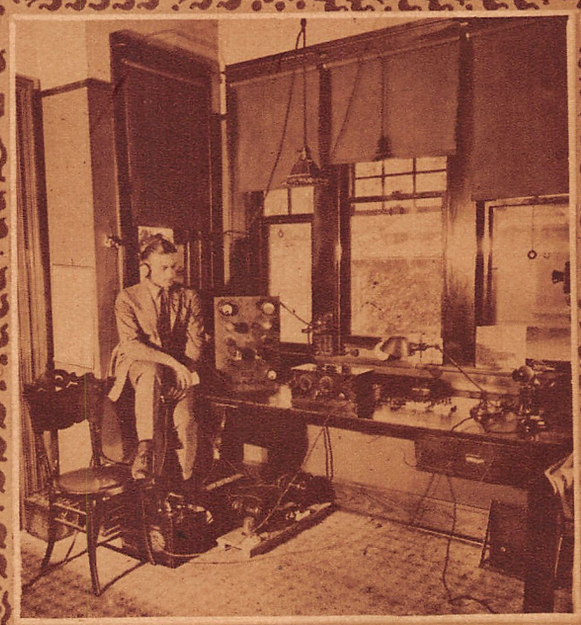
An Ardent Radio "Bug" Himself, "Long George" Kelly, the Heavy-Hitting First Sacker of the Giants, Tested Out the Radiophone Through Which a Running Story—Talked Off, Play by Play—Was Broadcasted During the World's Series.

For the First Time in History of Baseball the Plays and Scores Were Broadcasted by Radiophone. The Above Photo Shows Grantland Rice Broadcasting Results, and OGN From WJZ.

Novelties in Broadcasting

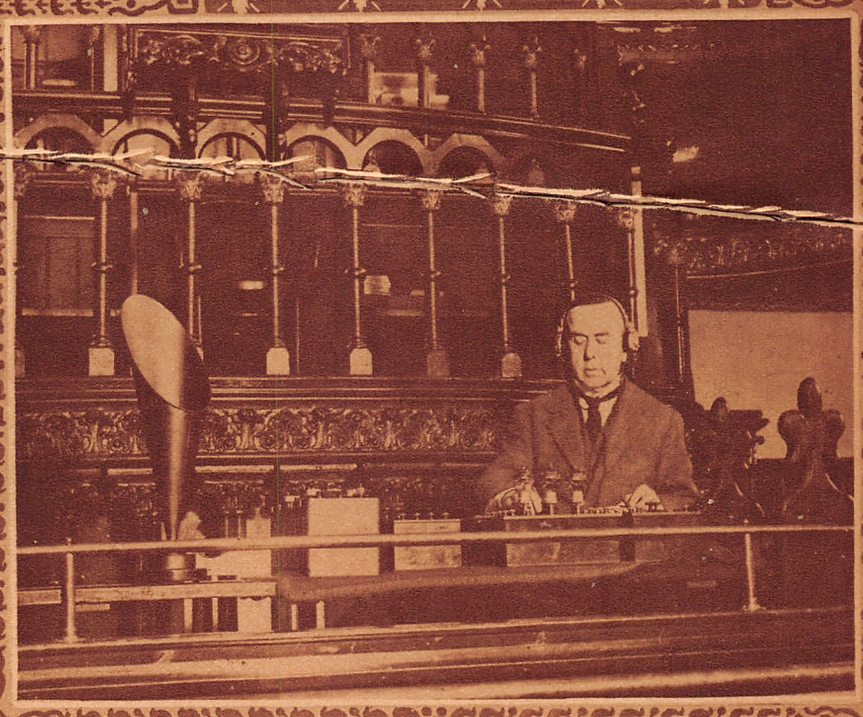


On the left and below are two photographs of WIAH, the broadcasting station of the Continental Radio and Manufacturing Co. of Newton, Iowa. The transmitter is only of low power, but covers quite a large area. The studio embodies several novelties in musical instruments. An elaborate system of bells, xylophone, tubes and other musical instruments is used to entertain the radio fans around town and in the vicinity.



Above is an original radio room. It was erected by an amateur who was tired of hearing the noises around the house and installed a unique radio room among the branches of a solid tree in his garden. There he can listen to the radio concerts to his heart's content without being disturbed.

On the right is a picture of a radio set installed in an English church to receive the sermons and services transmitted by radio as is already done in this country. Note the peculiar shape of the loud-speaker on the left.

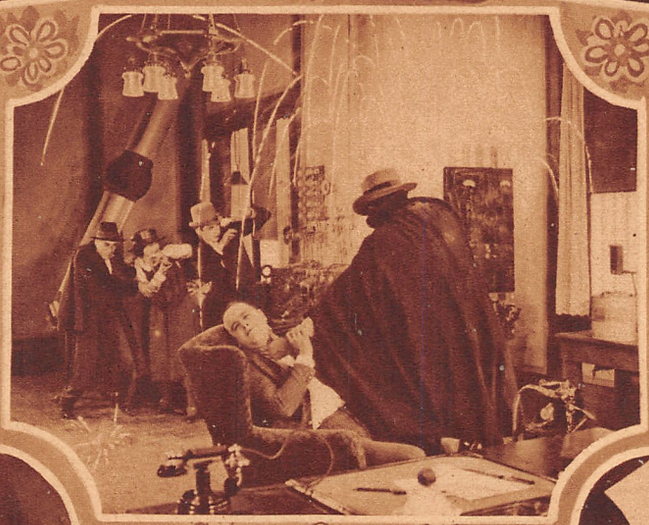


"The Radio King"*

Novelized by George Bronson Howard from the Universal Chapter Play of the Same Name by Robert Dillon

Above Is Bradley Lane Fighting the Anarchists When They Seized the Big Radio Station to Communicate With Their Friends in Europe.

Below Is Marnee, Master Criminal, Near the Special Apparatus For Recalling Messages Invented by Leyden.



Above Is The Man in the Cloak Trying to Obtain the Precious Cylinder.

Below Are John Leyden and His Daughter Ruth.

On the Left Are Marnee and His Accomplice in Leyden's Laboratory When the Set Is Destroyed.

CHAPTER VI

S. O. S.

The "Sea-Gull" was now headed for the open sea under its auxiliary power, as Bradley Lane hung suspended between the cross-trees and the deck; a noose thrown from above the crow's-nest having arrested his dive from the mainmast to the water.

"This time," Marnee shouted jubilantly, "this time you shall *not* escape. Renally! Fire!"

It was then that Ruth Leyden, brought to deck by the two ruffians who had seized her on the dock, broke from their grasp and running to Renally, pulled down his pistol-arm.

"No, no," she implored. "Don't shoot! I will tell anything, do anything, if you will spare him."

"What have you to give when the cylinder containing your father's secret has been destroyed?"

**A Super Serial Photoplay, Published in Collaboration with the Universal Film Corp.*

Ruth was in a quandary. She knew the truth about the cylinder. But what was it worth beside Bradley's life? Just then the man in the cloak offered an explanation.

"The cylinder my double smashed was a fake—she knows where the real one is now."

Now it was Marnee who had to make a decision. Of all things he desired Lane's death, yet the anarchists' cause might well depend on the Leyden cylinder.

"Where is the cylinder?" asked Marnee, his eyes leaving Lane's like those of a cat giving a mouse its liberty. In vain Lane forbade Ruth to tell. His life was her whole thought.

"The cylinder is——in the wall safe——in Mr. Lane's laboratory."

With a threat to Ruth, she and Lane were led away in opposite directions, Lane to be securely bound in the hold and Ruth locked in the cabin. Meantime the boat came to a stop and a small launch was sent ashore to secure the cylinder, while the plot to seize an incoming liner to radio the English Channel went on apace.

And what of Jimmy Lawton? No one had seen him come up from his drop into the water as the big schooner cast off. But Jimmy was an expert swimmer, and he very luckily came up so near the ship that he could reach a rope ladder and could not be seen from the deck. After he had satisfied himself that he had boarded the right vessel, Jimmy lay in hiding until the small launch pulled out, but he had heard everything and he knew the arrangement of the cabins where his friends were imprisoned. Also he knew the radio room—if he could only get to it. But it was well guarded and he waited with what patience he could muster. As soon as he saw his chance he slipped into the cabin, using a key he had taken out of Renally's pocket while the latter stood in the darkness only two feet away. In less than half an hour he had both Lane and Ruth free. It was fully half an hour more before Lane could walk, so stiff had he become in the irons by which he had been bound. Just as they were emerging from the cabin all three smelled smoke. A new terror had been added to their dire predicament, but the new danger held just as much menace to the captors as to the captives. The three therefore bent all their energies toward reaching the radio.

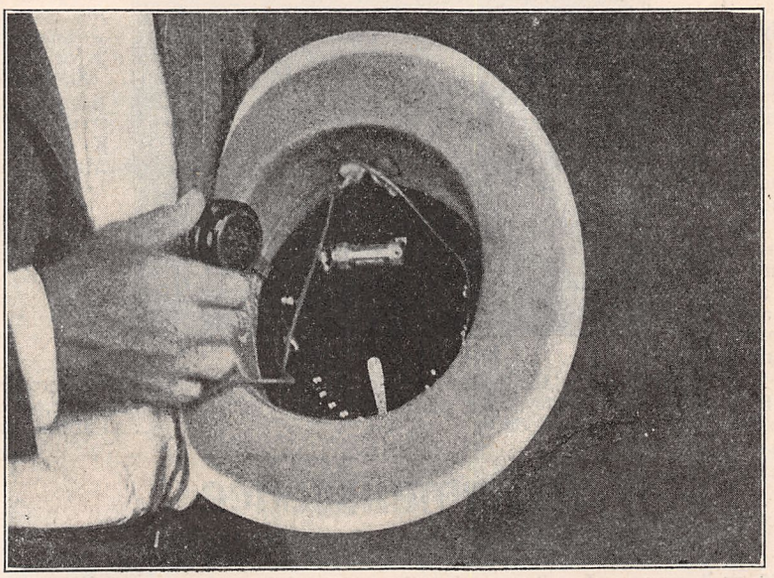
The spy sent away from the schooner had been successful in his task. Without any opposition, he easily opened the safe in the laboratory and found the precious cylinder. With a grunt of joy he turned only to find himself face to face with his double, a man cloaked and hatted like himself. A fierce struggle ensued from which Comrade X at length emerged the victor and made good his escape with the precious disc.

CHAPTER VII

SAVED BY WIRELESS

In spite of the raging passions and cruel anxieties that so lately had possessed those on the big schooner, the elements were now in full control. World power, unlimited wealth, revenge, all were sweet, but life was sweeter, and that now was threatened by the remorseless advance of the fire. As they hurriedly left the vessel one satisfaction alone remained. Lane, the girl and the traitorous young rascal, Jimmy Lawton, would all perish like rats. Their own safety they entrusted to the floating rafts and rowboats.

Warned by Fatty Evarts, the police in a harbor launch were rushing to the location given in the limping message that the least expensive set on the whole Atlantic Coast had picked up. For Fatty's set had been built from scraps and instruction books. But another boat was far faster than the police launch and this vessel, a lean prowed racer was just as anxious to reach the big schooner. It contained the Man in the Cloak, and this servant of Marnee had safely in his possession the real cylinder containing John Leyden's secret of recalling messages from the air. As the two smaller boats converged on Lon. 73° 32′ west Lat. 40° 25′ a tremendous flash of flame lit up the sky, and an instant later a deafening roar told the racing boats of a terrific explosion. When the Man in the Cloak reached the scene he was so closely pursued by the police launch that he had time only to pick up Marnee, Renally and a few of the anarchists. The fire of the police was unpleasantly close and there was not room for *all*, anyway. So he opened up the throttle and left a score of his comrades to their fate. The police realized that it would be useless to pursue so swift an enemy and turned their attention to the abandoned Reds. What was their amazement, however, on approaching the wreck of the schooner to see the three they set out to rescue floating on an overturned table.



Inside View of the Special Receiving Set that Bradley Lane Uses. It Is Hidden in His Hat and Is Always Ready to Receive a Warning or Communication From His House.

Ruth, Bradley and the boy had jumped just in time and the explosion had provided several articles on which they had been supporting themselves ever since.

The next morning saw the diminished band of Reds safely ensconced in Long Wong Fee's den in Chinatown. Marnee, Renally and the Man in the Cloak, and before them the precious cylinder with its record of recalling messages. To them, however, it was a closed book. Ruth Leyden was the only one who knew how to read its secret. To this puzzled trio was admitted after due precautions a newcomer. Undismayed by her surroundings, Doria Valerian had brought important messages from the ringleader in Moscow to Marnee. The European branch felt that Marnee's master wave might bring them to the apex of their power. And in his opinion now was the proper time to put it into operation because the band had been forced into hiding abroad and this messenger was sent to urge him on, and to assist in any way. To Marnee it looked like the very thing—this feminine touch. Ruth Leyden had escaped and she was still the only one who knew the cylinder's secret. Furthermore, she would not suspect Doria Valerian. She looked like Ruth's own kind.

So Doria was dispatched to decoy Ruth, using feminine wiles if she could, force if necessary, and the Man in the Cloak and a chauffeur were sent with her. All unaware of the danger, Lane had left the girl, who was now able to sit up in bed, in charge of Jimmy, while he went to a conference of detectives to try to locate Marnee.

But one eye was still on the crafty Reds, and that belonged to the mysterious double of the Man in the Cloak. The loss of the cylinder in Lane's laboratory had made him still more determined that it should never be used by Marnee. He had located Marnee by his unusual experiments, and had made his entrance to the Chinatown den. Here he overheard much that took place. And so it was that the headquarters radio caught this message:

"You will find Marnee hidden in Long Wong Fee's den in Chinatown. Also cylinder of John Leyden's secret."

Without an instant's hesitation a group of detectives, Lane at their head, dashed into the slant-eyed quarter of the city. Through secret doors and winding alleys on the heels of flying Celestials the detectives crashed. But the warning had been given and the Reds were on the run again. As Lane broke into Marnee's improvised radio workroom Marnee was just leaving it by another door. But as he jumped to intercept him his own private call sounded from Marnee's own magnifier.

"Renally and Man in Cloak and a girl are smashing down door—Ruth in grave danger."

Love or duty? Which to follow? But he had little choice. The way to get out was to follow Marnee. And the way led to the roof. As he reached it he saw Marnee just crawling to safety from a pair of cables which he had just crossed. Without a moment's hesitation he started to cross after him. To his astonishment Marnee no longer fled. He had stopped and was waiting in his characteristic pose of menace. As Lane reached the center of the space he saw why. Marnee had a pair of lineman's nippers and was cutting at the cable. It gave way. Lane almost lost his hold. Four stories above the street and only one cable to support him and Marnee cutting on that. Would he reach the other roof in time? Hand over hand he worked his way in frantic haste. Methodically Marnee cut at the cable. Snip, went the last strand of the cable and down went Lane.

CHAPTER VIII

THE MASTER WAVE

Had it not been for a passing wagon full of empty boxes, that fall from the severed wire would have seen the end of Lane and the triumph of the diabolical Marnee, who had cut the cables on which the detective had sought to follow the misshapen anarchist. As it was, he was only stunned. When he had regained his senses he saw the operatives herding a band of the Reds into police wagons. But Marnee and Renally were not among them. Again the master minds had escaped, only the underlings had been caught. Instantly he had a mental picture of Ruth in danger. Telling the headquarters' men that he would be down to prefer charges, Lane hurried away to the Leyden home.

His worst fears were confirmed. As he dashed around the corner of Grove street, he saw a crowd about the Leyden home. Following their gaze he saw to his horror Jimmy Lawton suspended by his jacket-collar to

(*Continued on page* 1172)

Who's Who in Radio

EDWIN H. ARMSTRONG

THERE is probably no other single person who has accomplished as much in the radio field as Edwin H. Armstrong, within the short period of his life, for Armstrong is a comparatively young man.

He was born in the U. S. A. on December 18, 1890. It was while he was a high school student in 1906 that he first became interested in radio. He had a receiving set in operation in his bedroom, where he conducted most of his early experiments.

At that time, there were no vacuum tubes, as we know them today. Instead, the two-element Fleming valve performed heroic service, and was then considered the last word in detectors. However, through DeForest's pioneer work in valves, Armstrong was able to secure an "audion," which was a three-element vacuum tube, and a forerunner of the modern triode. This was in 1911, and by experimenting with this new device, he tried to increase the sensitivity of his receiver.

Armstrong had been studying the technical side of radio, and the action of the vacuum tube in particular. He read every piece of literature then available on the subject. In the summer of 1912, it occurred to him to tune the plate circuit of the vacuum tube receiver, but it was not until the fall of that year that he carried on actual experiments.

He noticed that the signals became very much louder, but that there was a point in the tuning operation at which the signals became "mushy," and then disappeared. The point just before this hissing was noticeable, Armstrong found, was where the signals came in loudest. He had just discovered the phenomenon of regeneration. He was then but twenty-two years old! In his bedroom located in an apartment in Yonkers, N. Y., he continued to experiment, trying to understand the action of the apparatus, and in February, 1913, he thought he had found an explanation.

Edwin H. Armstrong

It was not easy for young Armstrong to convince his father and other influential relatives that he had made a discovery of importance. His uncle, however, advised him to have a copy of his circuit diagram witnessed by a notary public. This was done on January 31, 1913, and this document played an important rôle in subsequent suits in which Armstrong was involved.

Today, the Armstrong regenerative receiver is probably the most sensitive practical type of receiver available. Under the form of the short-wave regenerative set, using variometers to tune the plate and grid circuits, it has become standard with the thousands of telegraphing amateurs throughout the country in their long-distance relay work.

Not to be outdone by this important contribution to the radio art, Armstrong experimented and worked still further. He conceived and constructed the "super-heterodyne" receiver while an officer in the U. S. Signal Corps. By means of this new type of receiver it was possible for him to pick up signals from low-power German trench sets which were sending out confidential matter, with a small loop in the front-line trenches. For the valuable work which he did, he was promoted to the rank of Major, and made Chevalier of the Legion of Honor.

Upon his return to the United States, Armstrong started on a hunt which was to lead him far. He had the notion that something better than regeneration could be discovered. You have all noticed that when you tune your regenerative receiver, the signal strength increases in a greater proportion, as the regeneration control is turned. A point is reached, however, when the signals become mushy, and are no longer clear and distinguishable.

(*Continued on page* 1201)

A Reminiscence

By ADRIAN VAN MUFFLING

IT was during the fall of 1900, or it may have been 1899—I do not remember the exact date—that I first came in contact with the remarkable invention that has since, both actually and figuratively, electrified the entire world.

I was then attending High School in Rome, Italy, and I well remember the thrill with which I greeted the news that my mother was waiting for me in the principal's office and had actually obtained that august functionary's permission to have me "cut" the remainder of the day's classes to attend a private lecture.

As correspondent of several foreign newspapers, she had obtained tickets to a demonstration that was to be held in one of the halls of the University at which the invention of a young chap, rather unknown, named Guglielmo Marconi, was to be shown in public for the first time. This fellow Marconi —would you believe it?—claimed to have actually succeeded in sending telegraphic messages through the air, *without using a wire!* Some reports about his exploit had been published now and then, but so far no one had taken the matter very seriously. "Another one of these wild schemes," the wiseacres said. But now finally the mystery was about to be unveiled, and all the prominent people, including the Dowager Queen Margherita, had been invited to attend. Although by no means at that time qualifying as one of said notables, I was privileged by fortuitous circumstances to sit for one afternoon among the elect. We came, we saw and—we were conquered.

I well remember the scene. A long, bare hall reeking of that all-pervading mustiness peculiar to University lecture rooms the world over. On a platform at one end a long table covered with much brassy and formidable looking paraphernalia. At the other end a similar table about 60 feet from the first and similarly encumbered. Another such outfit was located on the roof of the building and finally one could be found at the Monte Mario observatory if one cared to make the three-mile journey to that historic spot. The audience, as I remember it, was fashionable, hot, and frankly skeptical. It was in the days of bustles and leg-o'-mutton sleeves, and the ladies were decidedly in the majority.

The lecturer was a thin, quiet and unassuming man, looking younger than his age. Of the lecture itself, of course, I remember very little. But I can still see the man on the platform lift piece after piece of apparatus and explain its purpose and operation, by demonstration and with the help of some huge charts hanging against the wall. I do remember that the word "coherer" was mentioned more frequently than any other, and to our ears it had an outlandish, barbarous sound. We were all duly impressed with its importance, although I doubt that any but a few of the audience carried with them a fair knowledge of a coherer's purpose of existence, even after the exhaustive treatment accorded to it by the speaker.

When the actual demonstration began the audience must have expected an almost supernatural manifestation, and they were not disappointed. Sparks, hisses and flashes, and the ladies shuddered. Some one in the audience would write a sentence on a slip of paper and hand it to the operator; it was then sent across the hall and the operator at the other end would read it amid a hushed silence followed by frantic applause. When four husky porters lifted the table from the floor and still the messages went through, enthusiasm knew no bounds. For had not the entire audience actually *seen* that there were no hidden wires leading through the floor?

Afterward messages were sent to the station on the roof and to that on the distant hill, and were relayed back by telephone. Contrary to expectations, everything functioned perfectly and there was no hitch of any kind.

Although duly impressed by what they had seen, no one took the matter very seriously. "An interesting toy!" was the general verdict. But patriotic sentiment was duly aroused. "Viva l'Italia e il Signor Marconi!"

A few weeks ago I happened to travel over our metropolis seated on the luxurious cushions of an aerial limousine, with a pair of receivers at my ears. While crossing the East River I listened to a song—a record by Caruso, another of Italy's immortals. And harking back to that assemblage in far off Rome many years ago, I wonder what would have happened if someone had stood there on that platform and publicly declared that within less than 25 years that young high-

(*Continued on page* 1100)

The Electric Light Line in a Dual Role

By JOHN B. BRADY*

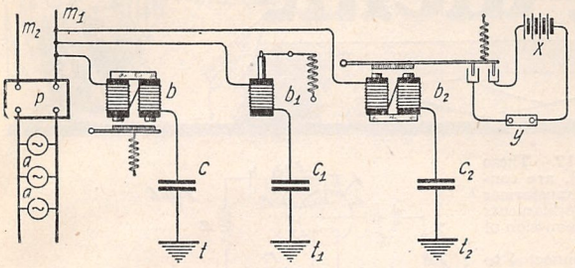


Fig. 2

In the Remote Control Method Described in This Article, Relays Closing Local Circuits Could be Operated by Superimposed Currents Traveling on the Light Line.

THE recent announcements of broadcasting over electric light lines whereby a public service station might, through its extended net of electric light lines, transmit into every electrically equipped home, music, concerts and lectures, bringing to a reality what must have been a dream in the past of a Frenchman by the name of Cesar Rene Loubery of Paris, France.

On July 9, 1900, Loubery filed an application for patent in this country in which he showed circuits for telegraphing over the same wires which supplied electric power and incandescent lighting. The drawings of the Loubery patent are very interesting as of this early date. The drawings are reproduced herein and show methods for utilizing the main supply circuit, or a part thereof, of an installation or system for electric lighting for transmitting telegraphic signals over the same installation, or for operating solenoids located at different points along the main supply circuit; for example, in homes supplied with electric light for cutting on the electric light power in such homes at predetermined times. The invention is based on the employment of a series of relays placed at the stations or houses of consumers or customers who are supplied with electricity generated at a central station. Means are provided at a suitable point, such as the central station, for impressing upon the circuit of the relays currents of different frequencies which are adapted to selectively operate the relays, which in turn are adapted to actuate appropriate mechanism for giving signals, indicating time, etc.

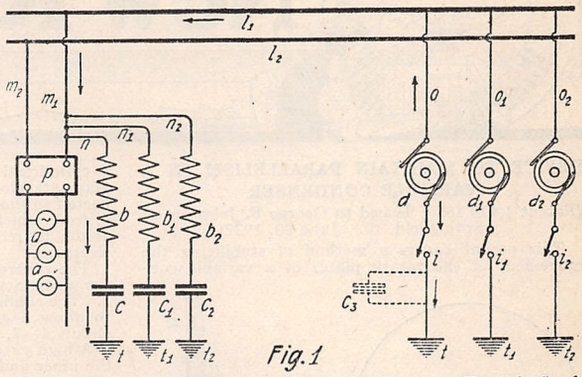


Fig. 1

In This Early, Remote Control System the Inventor Used A. C. of Various Frequencies to Operate Relays. The Light Line Was Used as Conductor for the Signals.

Fig. 1 is a schematic view of the whole of the system; Fig. 2 illustrates the arrangement of the receiving station of a customer; Fig. 3 is a modification of the arrangement at the receiving station; Fig. 4 is a detail view of the receiving coil actuating the general interrupter of the circuit; and Fig. 5 illustrates the application of the system with a continuous current.

Let 1^1 1^2 indicate the main electric conductors in the service of a customer; a a a, the customer's apparatus (such as electric lights) to be worked; b b^1 b^2, a series of coils branched on the wire m′, as indicated in Fig. 1, in advance of the meter p, the other end of each coil being connected with the ground through intermediate condensers c c^1 c^2. The transmitting station is provided with a series of generators of alternating currents d d^1 d^2, of which one end is connected with the main conductor 1^1 by the wires o o^1 o^2, while the other ends are connected with the earth after passing through the interrupters i i^1 i^2.

Let N N^1 N^2 represent the frequency of the currents developed by the generators d d^1 d^2, respectively.

Let us suppose, say, the first interrupter i is closed. In order that the current from the first generator d may pass into the first coil b of the customer and thence through the condenser c to the earth, it is necessary that the self-induction of this coil b and the capacity of the corresponding condenser c should be so calculated that these two apparatus should be in electrical resonance with regard to this frequency N, according to the formula

$$4\,\pi^2\,N^2\,C\,L = I,$$

in which C represents the capacity of the condenser, and L the self-induction of the

(*Continued on page* 1240)

**Patent Lawyer, Washington, D. C.*

A New Method of Doubling the Efficiency of High Power Radio Stations

By HENRI ABRAHAM and RENÉ PLANIOL

THE future of long distance radio depends chiefly upon the method that will be here described to increase the efficiency of high power radio stations. The upkeep of these stations is such that very little profit will be made from its exploitation unless the traffic may be increased in such proportion that the profit made by the company operating it will be real. In this description, we intend to expose the principle of a new method which will double and even triple the efficiency of a commercial station by sending simultaneously, two or three telegrams with the same transmitter on the same aerial in such a way that the total power of the station will be used for each transmission, keeping the range the same as if only one message was sent.

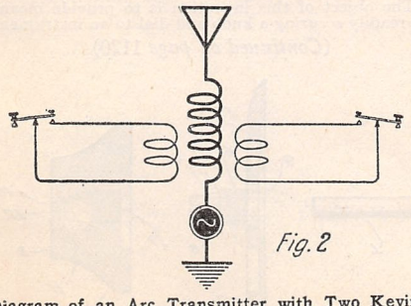


Fig. 2

Diagram of an Arc Transmitter with Two Keying Circuits for the Sending of Two Messages Simultaneously.

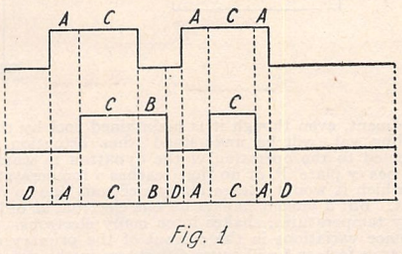


Fig. 1

The Upper Line Shows the Letter M Being Sent by the First Key and the Lower One the Letter N Sent by the Other. The Letters Show the Various Waves Which Are Emitted.

Some experiments have been made to increase the output of a station by sending several messages through the same aerial by the same process which is used in line telegraphy. In the case of wire telegraphy, the use of alternating currents of various frequencies gives a very good solution. Each telegram is sent on a separate frequency, the current traveling on the same line and received through resonant circuits tuned to the different frequencies, separating the currents which are directed on separate receivers. This simultaneous transmission can be made without any trouble, as the tensions which are added are very small and cannot endanger the insulation. The consumption of current is so small that the cost is almost negligible.

Short range radio communications may be compared to this, as the insulation of a good aerial is sufficient to resist the small tensions produced by the combination of transmissions, and the energy spent for the transmission is but a small fraction of the large upkeep cost. At the present time, there are some installations using the Diplex system, sending in the antenna at the same time, high frequency currents corresponding to different wave-lengths for each telegram. However, the conditions are not the same in high power stations, as they are so designed that the total power is used in the antenna which, consequently, functions near the resistance limit of the insulators. In this case, it is not possible to

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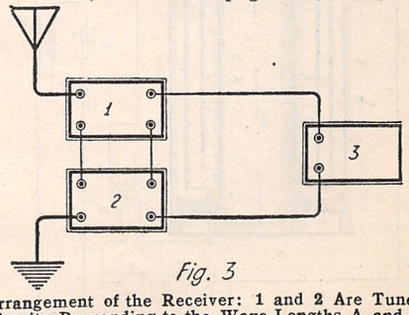


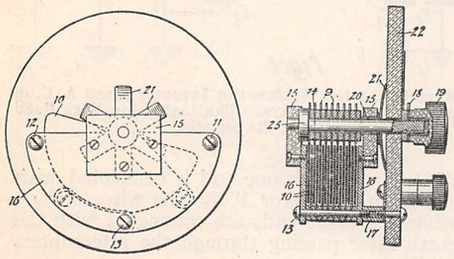
Fig. 3

Arrangement of the Receiver: 1 and 2 Are Tuned Circuits Responding to the Wave-Lengths A and C or B and C. 3 Is the Receiver Proper.

DEVICE TO MAINTAIN PARALLELISM IN A VARIABLE CONDENSER

(Patent 1,420,485. Issued to George F. Johnson, of Springfield, Ill. June 20, 1922)

This patent covers a method of stabilizing the movement of the rotary plates of a variable con-



denser to prevent wabbling and to preserve parallelism between the plates as the rotary plates are revolved. The method by which this is accomplished is illustrated in the diagrams. To prevent inaccuracy of movement, a slip bushing, 20, is fixed to the arbor, 14, and this bushing is engaged by a flat star spring, 21, which makes contact with the surface of the panel, 22. This spring also keeps the plates of the rotor and the stator parts properly centered with each other.

RADIO-ELECTRON OSCILLATOR

(Patent 1,424,091. Issued to Claude R. Fountain, of Macon, Georgia. July 25, 1922)

A primary object of this invention is to provide a radio-electron oscillator capable of handling a very large energy output. A further object is to provide a simple means for controlling this energy output.

Figs. 1 and 2 are views partly diagrammatic, illustrative of the best reduction to practice of the invention. Referring to the diagrams, Figs. 1 and 2, it will be found that the oscillator (12 to 19, inclusive) is used in conjunction with direct-current generators 1 and 2, a fixed condenser 3, a variable condenser 4, a telephone transformer 5, a power transformer 6, a radio transformer 7—8, a microphone transmitter 9, a key 10, and a battery 11. The Radiotron or oscillator alone consists of an inner metallic cylinder 12, an outer metallic cylinder 13, incandescent light filaments, 14 and 15, acting when hot as sources of electrons, a light metallic grid 16, of annular form, interposed between and spaced from the cylinders 12 and 13, a comparatively heavy metallic grid 17, of annular form preferably interposed between and spaced from the grid 16 and the outer cylinder 13, and annular insulating closures 18 and 19, interposed and secured between the cylinders 12 and 13.

The two generators 1 and 2 are connected in series. The negatively charged end of the generators is connected to the middle of the secondary coil of the transformer 6. The positive end of the generators is connected to the heavy grid 17. The outer cylinder 13 is joined to one side of the oscillation circuit 4—7, while the other side of said oscillation circuit is connected to a point between said generators as shown.

The incandescent lamp filaments 14 and 15 represent two of a number of parallel filaments arranged in a cylindrical form around the cylinder 12. These filaments electrically joined in a parallel, are connected to the two terminals of the power transformer 6, from which power is drawn to keep the filaments at the desired temperature for the proper emission of electrons.

The control elements 12 and 16 are connected to the secondary terminals of the telephone transformer 5. The condenser 3 is shunted across the generator 1 to allow a greater effect of the oscillations in the circuit 4—7, upon the heavy grid 17.

A high vacuum is maintained in the space between the inner and outer cylinders 12 and 13. Moreover, the cylinders are immersed in oil with a view to preserving the vacuum and increasing the insulation while tending to maintain the instrument as a whole in a cool state. See labeled arrows in Fig. 1.

The circuits that I illustrated are not materially different from those shown in "Radio telephony" by Goldsmith, Fig. 176, page 177. The chief differences are those required for large capacity circuits. The two generators 1 and 2, taking the place of the two parts of the battery B^1, while the transformer 6 takes the place of the battery B^2. In this improvement one terminal of the telephone transformer 5 is connected to the inner cylinder 12 instead of being connected directly to the filaments as in all other types of vacuum tube oscillators and amplifiers extant. The inner cylinder is new, as is the design that obviates the necessity of employing a glass container for the elements in vacuo. The inner cylinder, by its proximity to the hot elements, becomes negatively charged, and the grid 16 will also be negatively charged under normal conditions. The driving of electrons off the cylinder 13 under increased bombardment, even though it is maintained cool by the cooling vat, will be understood when attention is directed to the operation of the dynatron in which the heavy plate, P, at no time reaches a temperature at which it would release many electrons due to its heat. But a violent impact by one electron, at ordinary temperatures, shakes loose many electrons.

Fig. 1

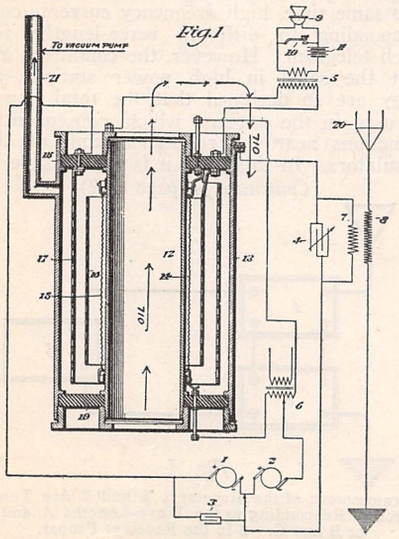
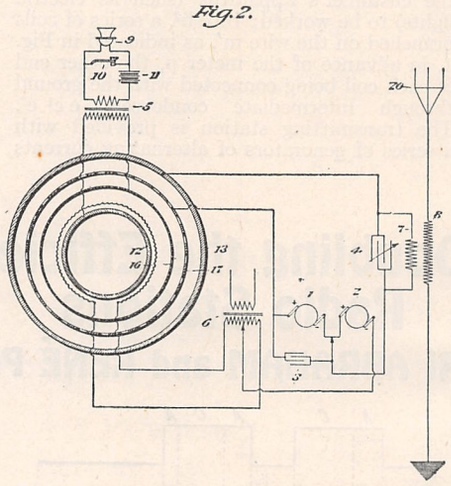


Fig. 2.



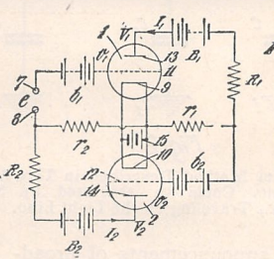
Since variations in the current of the primary of the transformer 5 will cause differences in the potentials at the terminals of the secondary coil of 5, it will be evident that the potentials of 12 and 16 will by synchronously but oppositely changed by such variations of current in 5.

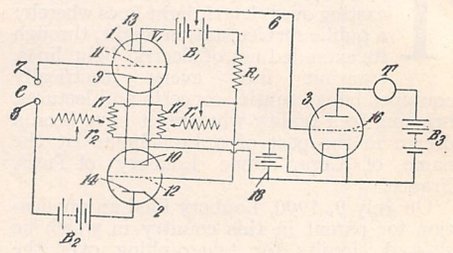
It will also be evident that these changes in potential of 12 and 16 will operate in concert to change the speed of the electrons from the filaments 14 and 15 toward 13 and 17. That is, at one instance when 12 is positively charged and 16 is negatively charged, the effect of each will be to decrease the speed of the electrons toward 13 and 17. At another instant, the charges on 12 and 16 will be reversed and both will act to increase the speed of the electrons striking 13 and this will liberate a greater number of electrons, thus increasing the electron current from 13 to 17.

Irrespective of the theory of operation of such a device, the energy supplied by the generators 1 and 2 will cause strong oscillations to develop in the circuit 4—7. Variations in this energy may be obtained by the impact of air waves upon the microphone transmitter 9, or by making and breaking the battery circuit through the key 10.

Manifestly in this novel oscillator duplex control is afforded by the grid and cylinder or equivalents thereof at opposite sides of a common source of electrons, and said elements acting synchronously to amplify or diminish the speed of the electrons toward the element 13, constitute an important characteristic of the invention.

Fig. 1.





A NEW AMPLIFYING CIRCUIT

(Patent 1,422,013. Issued to L. B. Turner, of Cambridge, England. July 4, 1922)

This invention introduces a new method of amplifying radio frequency currents. Fig. 1 illustrates the arrangement of circuits which constitute the basic principle of this system.

The results are attained by resistance retro-actions between the plate of one tube and the grid of a second tube and between the plate of the second tube and the grid of the first tube. A rise of potential in the grid of the first tube produces a rise of current to the plate of this tube which effects a fall of potential of the grid of the second tube and fall of current to its plate with a consequent rise of potential on the grid of the first tube. Thus any change of potential of the grid or plate may be made more or less to sustain itself.

The principle may be put into effect in various ways, and may be applied to obtain amplification of electromotive force or current of any form, rectification of alternating or pulsating currents, control of electric circuits by variation of their resistance, and generation of sustained oscillation, in any manner in which other negative resistance devices may be used for these purposes. Moreover, the circuits, according to the invention by which amplification or rectification or both are obtained, may be so adjusted that as the strength of the applied signal is increased, the effect produced rapidly falls short of being proportional to the signal; so that the circuits may be used as a limiting device very sensitive to weak signals but insensitive or less sensitive to strong signals; the saturated or insensitive condition being reached, when the values are suitably chosen, with very much weaker signals than are required to produce a corresponding limiting effect in amplifying or rectifying instruments in common use. The invention in this form may be used as a current-limiting amplifier for wireless signals, to aid in cutting out interference from atmospherics or other signals.

Fig. 2 shows one of the practical forms of circuits suggested by the inventor in which the output of the amplifying system is applied to the grid and filament of a third tube which acts as a detector. In Fig. 2, the battery, B2, is quite small or may be omitted. Connection 6 is made by tapping the battery, B1.

COMBINED KNOB AND DIAL

(Patent 1,420,295. Issued to Robert W. Tait, of New York. June 20, 1922)

The object of this invention is to provide means for readily securing a knob and dial to an instrument

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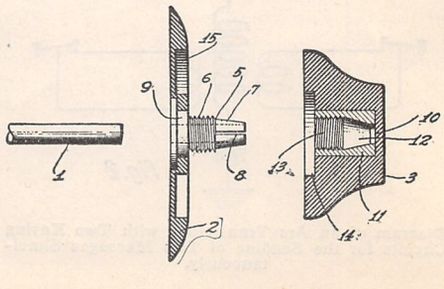


Ship's Position Determined From Single Radio Compass Station

By H. HIGHSTONE

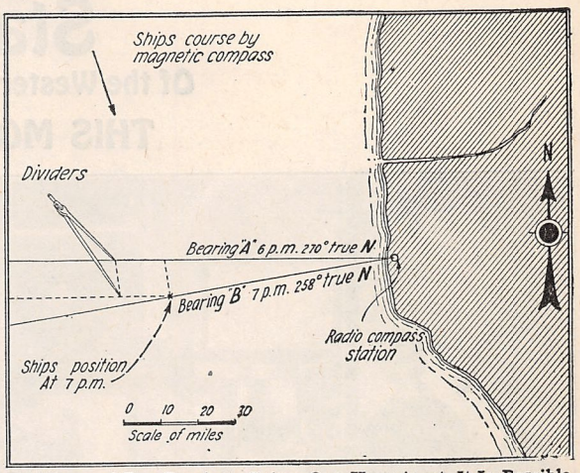
WHILE it may seem an impossibility, the determination of a vessel's position from one compass station, instead of the usual three or four, is quite easily accomplished, and is accurate enough for all practical purposes.

The method explained herewith is in use at present, to the writer's personal knowledge, on the Pacific Coast, and is used to check the calculated course of a ship in foggy or hazy weather. It is nothing more than the simple problem of finding the third side of a triangle, two angles and two sides being given.

The manner of procedure is as follows: A bearing is obtained from the coastal station at, say, 6 p. m., giving a reading of 270 degrees true north from the land, and at 7 p. m. another is procured, giving a reading of perhaps 258 degrees. Extending the two bearings from the compass station on his chart, the navigator forms two sides of a triangle. Looking at the log, which is sort of a marine speedometer, he finds that the ship has traveled 10 miles during the past hour, between six and seven o'clock. Setting his dividers to the scale of 10 miles on the chart and placing one point on bearing A, he moves them along this line in a position parallel to the course the ship is steering by the magnetic compass until the other point is upon the line of bearing B. Drawing a line between the two points he has the course which the ship has taken for the past hour, and its position.

The errors in compass readings from the shore stations are now reduced to such a minimum, that with careful plotting on the chart, a very accurate position can be obtained within a radius of 30 or 40 miles from the land station, and by obtaining successive readings every hour the vessel's course can be laid out on the map. The great value of this method in detecting the deflection of the ship from its course by marine currents can be readily seen.

Blunt's Reef and Cape Mendocino on the coast of California are a special bugaboo to navigators, for here the land makes a sharp dip to the eastward, and if they do not immediately change the course of the ship upon passing it, they find themselves many miles out to sea, losing time and money for the owners. However, if they turn before they reach it, and many navigators have done so, to their sorrow in foggy weather, they quickly pile up on the rocks. It is a case of risking the ship to make time and stand in well with the owners, or playing safe and risking their displeasure. Many have taken the risk and lost, while others, thinking themselves far to sea, have turned too quickly, and this "graveyard" of ships, as it is aptly named, has taken toll of over 20 vessels and many lives in its history. But now, thanks to the radio compass at the Eureka Naval Radio station (NPW), this reef-strewn stretch of sea extending many miles out from land is robbed of its terrors, and ships can skim its edges in any weather without fear of rocks or loss of time



By Means of Two Bearings, Taken One Hour Apart, It Is Possible to Determine the Ship's Position from a Single Radio Compass.

"ARCS"

By C. L. WHITNEY

ARCS are still a great mystery to such a large number of Licensed Commercial Operators that a short talk on this subject would not be amiss. The method of generating oscillation by an arc using direct current was first discovered by Prof. Elihu Thompson in 1892, and has been developed in the United States mainly by the Federal Telegraph Company, who built practically all the arc equipments now installed on United States Shipping Board vessels, numbering approximately one hundred at the present date.

The Federal people say that "All Federal Arc Radio Transmitters are based upon the method of obtaining undamped radio frequency oscillations by means of an electric arc. The arc is enclosed in a chamber with an atmosphere containing hydrogen, and the electrodes are placed between the poles of a powerful electromagnet, which produces a strong traverse magnetic field tending to blow the arc out. Carbon is used for the negative electrode, while the positive is made of copper, and is water cooled."

This "method" puzzles most of us, but if the following simple description is read and thought over the "method" becomes somewhat clearer.

A condenser and an inductance are connected in series and the two leads shunted across the arc (Fig. 1). Part of the current flows into the condenser, thus robbing the arc of part of its current. This causes the direct current supply potential to rise, and as the condenser naturally continues to charge the arc current is still further reduced. Then the condenser begins to discharge, increasing the arc current and reducing the D.C. potential until the condenser is almost completely discharged. Then the same thing happens all over again. The speed or frequency of this repeated charge and discharge is governed by the capacity of the condenser and the amount of inductance in the circuit. Now think back to your simple beginner's knowledge of radio and you will remember that this same frequency controls the length of the wave; that is, an increase of either the capacity or inductance will increase the length of the waves produced, and inversely a decrease of either one will reduce the wave-length.

The D.C. voltage necessary to produce these oscillations depends upon the resistance of the oscillatory circuit. In the 2 K.W. set the voltage used ranges from 250 to 400 volts, while in the 5 K.W. set it may range up to 500 volts.

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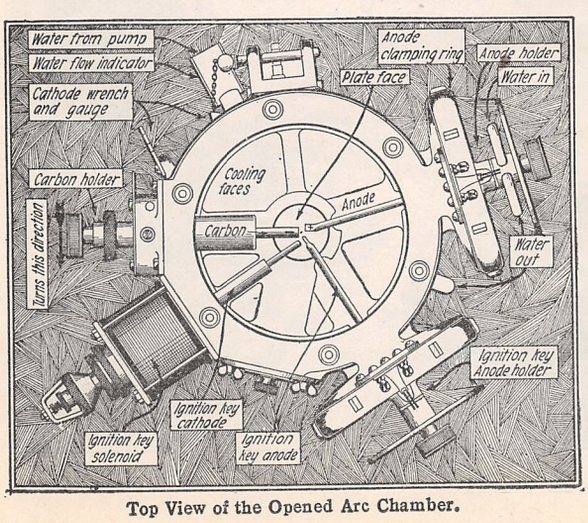
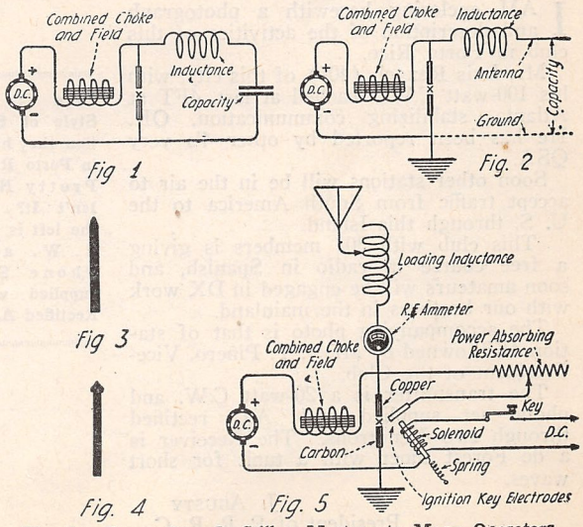
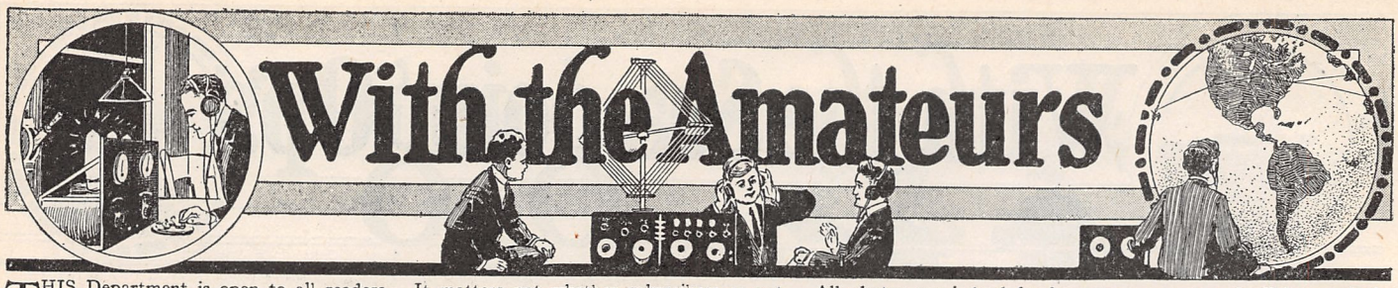


Top View of the Opened Arc Chamber.



The Arc Transmitter Is Still a Mystery to Many Operators, Though Its Theory of Operation Is Simple to Understand.



THIS Department is open to all readers. It matters not whether subscribers or not. All photos are judged for best arrangement and efficiency of the apparatus, neatness of connections and general appearance. In order to increase the interest in this department, we prefer to publish photographs of stations accompanied by a picture of the owner.

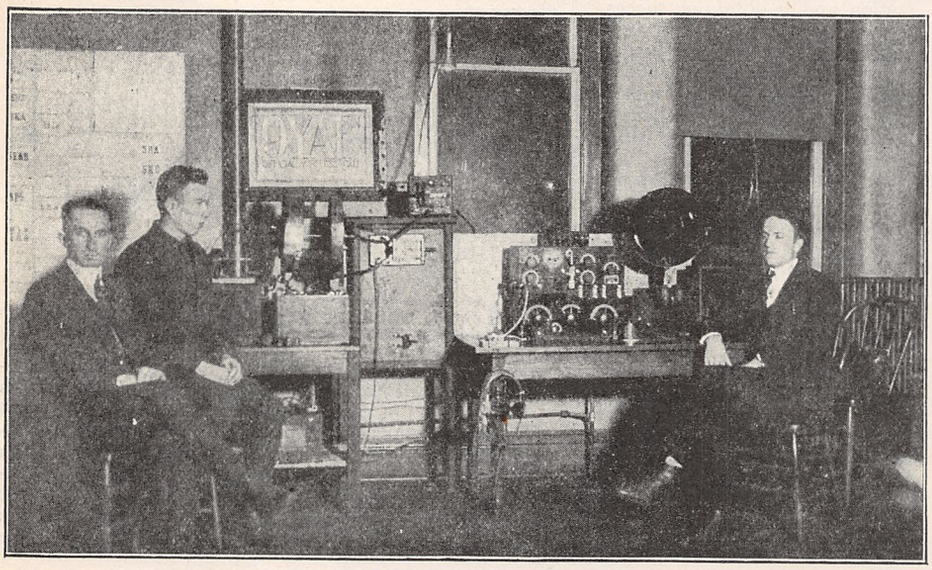
We prefer dark photos to light ones. The prize winning pictures must be on prints not smaller than 5 x 7". We cannot reproduce pictures smaller than 3½ x 3½". All pictures must bear name and address written in ink on the back. A letter of not less than 100 words giving full description of the station, aerial equipment, etc., must accompany the pictures.

PRIZES: One first monthly prize of $5.00. All other pictures published will be paid for at the rate of $2.00.

Station 9YAE

Of the Western Union College, Le Mars, Iowa

THIS MONTH'S PRIZE WINNER



With their Old Fashioned Stone Crusher these fellows have made some good distances. We Wish Santa Claus would bring you a couple of 50 Watts.

THE photo is that of our station 9YAE, Western Union College, Le Mars, Iowa. The set consists of a 1-K.W. Clapp-Eastham Transformer, Sayville type rotor, home made O. T. primary 3" and secondary 2" wide. Leads to condenser are made extremely short due to position of glass plate condenser. We have two aerials, one running north and south of T type 100' long and 70' high, and an L type running east and west. With these two aerials we get good distances in all directions. The leadins are large and the ohmic loss is small.

The receiving set is a Paragon with an AGN-1 detector and amplifier. At the extreme right of photo is an extra two-step amplifier made in our laboratory. For long waves we use the de Forest coils and for foreign press we disconnect the detector and use the first amplifying transformer for the inductance. With the Magnavox and high plate voltage we can read POZ and LY all over the laboratory. The picture shows the arrangement of apparatus. With this station we have worked both coasts and talk regularly with 7ZU and 8ZP. During the past month we have handled over 150 messages. Since the picture was taken, a radiophone has been installed.

The success of the station is due to D. O. Kime, Head, Dept. of Physics, (extreme left) N. Brauch, Ex. Army radio operator and instructor in code (extreme right) and to operator D. Streyffeler (center).

D. O. KIME, *Dept. Physics,*
Western Union

Radio In Porto Rico

A Letter from the Porto Rico Radio Club

I AM enclosing herewith a photograph and description of the activities of this club in Porto Rico.

Mr. Luis Rexach (40I) of this city, with his 100-watt C.W., reached at last, 4FT at Atlanta, stabilizing communication, OK. He has been reported by other 4's very QSA.

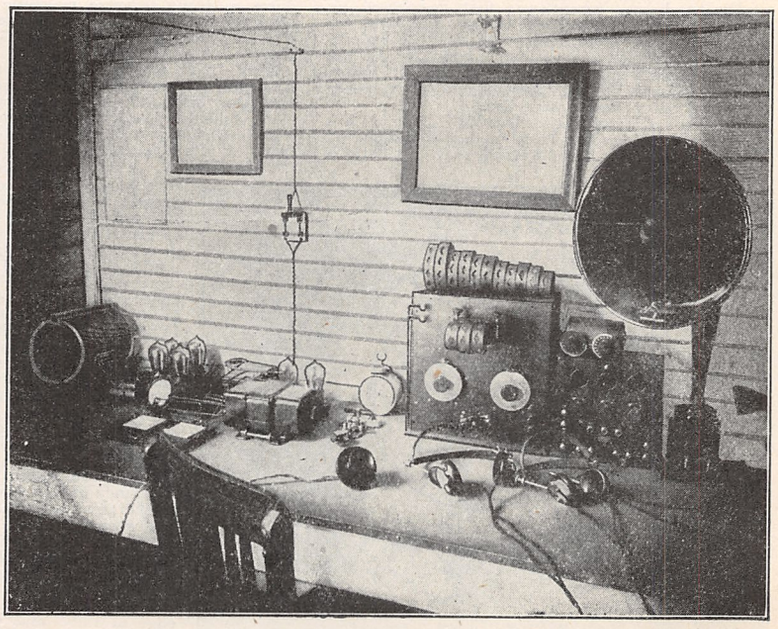
Soon other stations will be in the air to accept traffic from South America to the U. S. through this Island.

This club with 302 members is giving a free course in radio in Spanish, and soon amateurs will be engaged in DX work with our brothers in the mainland.

The accompanying photo is that of station 4KT owned by Mr. J. T. Piñero, Vice-President of the Club.

The transmitter is a 20-watt C.W. and phone set supplied with A.C. rectified through two Kenotrons. The Receiver is a de Forest tuner with a tunit for short waves.

J. AGUSTY
President of P. R. R. C.
Apartado 868, San Juan, P. R.



Here is the Style of Station they have in Porto Rico. Pretty Neat Isn't It? On the left is the C. W. and Phone Set supplied with Rectified A. C.

Ernest J. Schultz's Station 8BNX, at Toledo, Ohio

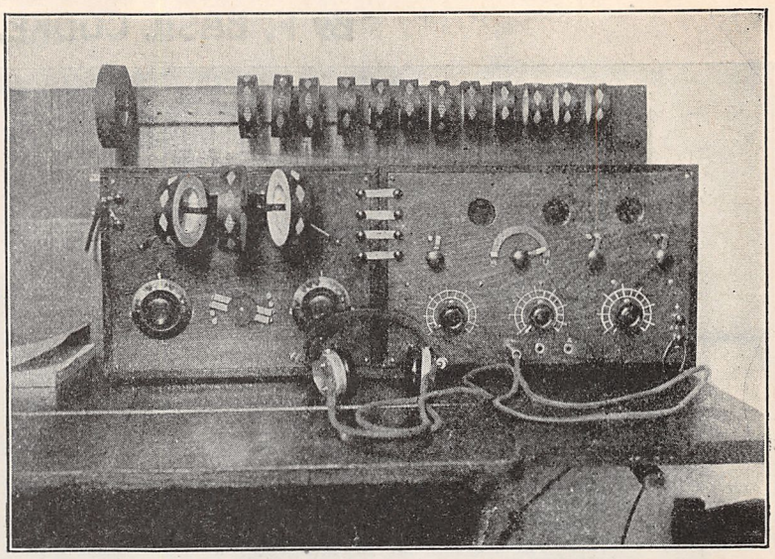
IT is a great pleasure to submit a photograph of my receiving set, which is installed at my home in Toledo, Ohio.

My aerial, which is of the inverted type, is made up of four wires 65′ long, spaced 2⅜′ apart. It is 35′ high at both ends. The ground consists of water pipe and sheets of metal buried 6′ underground beneath the aerial.

The transmitter, which is not shown, consists of a spark coil, condenser, gap and oscillation transformer. I expect in the near future to install a C.W. and phone set, also a ½-K.W. spark transmitter.

My receiving set is one of my own design and make, using a honeycomb coil for both short and long wave receiving. The panel containing the honeycomb coil and variable condensers is 13″x9½″. The audion control panel is 15½″x9½″. The phone connections to the detector and various stages of amplification are made by means of plug and jacks.

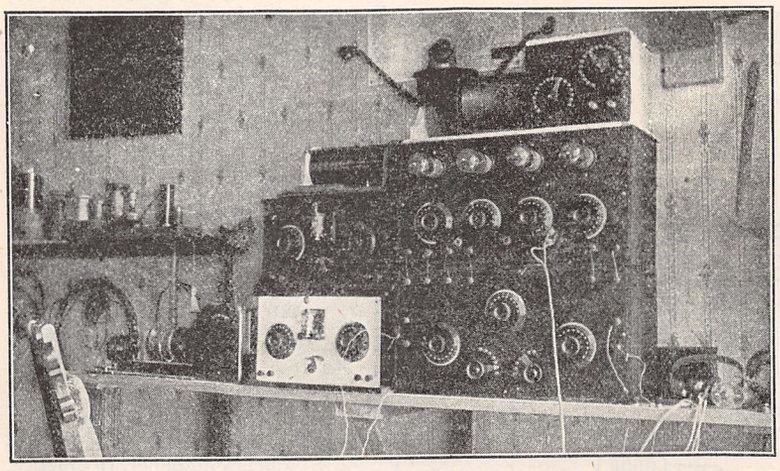
The receiving is as good as any I have ever heard. I have heard YN, FL, WSO, NFF, NSS, etc. Commercial stations along the coast and Gulf and amateur stations from the second district are heard very clearly. Radiophone concerts from 2XB, New York, N. Y.; WJZ, Newark, N. J.; KDKA, Pittsburgh, Pa.; WBL, Detroit, Mich., and a great many others are heard very QSA with one tube. Since this picture was taken I have installed a loud-speaker, using a Baldwin type E phone and a phonograph horn. With one stage of amplification signals and music can be heard from 100′ to 200′ from the horn. I would like to hear from fellow amateurs who are using honeycomb coils for both long and short wave-lengths.



Here Is Another Example of Good Workmanship. The Tuner and Amplifier are Mounted On Wooden Panels and Yet Look Fine.

ERNEST J. SCHULTZ,
1311 Colburn St. Toledo, Ohio, 8BNX

Andrew G. Tynan's Station



Andrew Has No Transmitter, But His Receiver and Amplifier Which are Home-Made are of Good Appearance. Compliments For the Workmanship OM.

BEING a subscriber to your excellent magazine, I take pleasure in sending a picture of my radio outfit. My equipment consists entirely of receiving apparatus, the large set is a regenerative receiver, one-stage radio frequency and two-stage audio amplifiers. The two small sets to the left are crystal, which I use for nearby stations and for experimental purposes; on top of these sets may be seen a double slide tuner and on top of the large cabinet is a loose coupler which tunes to 3,000 meters. This whole equipment is home made; besides this there is, of course, the miscellaneous apparatus that is usually found around, such as a spark coil (home-made), a storage "B" battery (also home-made) and motors.

Since this picture was taken a home-made battery charger has been added to the set.

ANDREW G. TYNAN,
905 Kirklinde St., N. S. Pittsburgh, Pa.

DX WORK

THE following amateur signals have been heard here on 360 meters, and not having a copy of amateur calls we are at a loss to know who the stations are controlled by so as to advise them.

The distances may be something of a record for amateur transmission, especially those from the 9th district.

7.20 p. m., KGU de 6ZG; Apia time, 6th September.

6.36 p. m., CQ de 6ZX; Apia time, 6th September.

6.37 p. m., 5DI de 9ZAF; Apia time, 7th September.

6.42 p. m., CQ de 9ZAF; Apia time, 7th September.

The signals were picked up on a single valve reaction receiver.

E. E. DUNWOODIE,
Officer in charge of Apia,
Samoa, Radio Station.

STEALING CALL LETTERS

The C.W. station signing 3BV is not the licensed station using that call. I have numerous "QSL" cards, some of which say

(*Continued on page* 1231)

Forest F. Spencer's Station 9BEE
At Mounds, Illinois

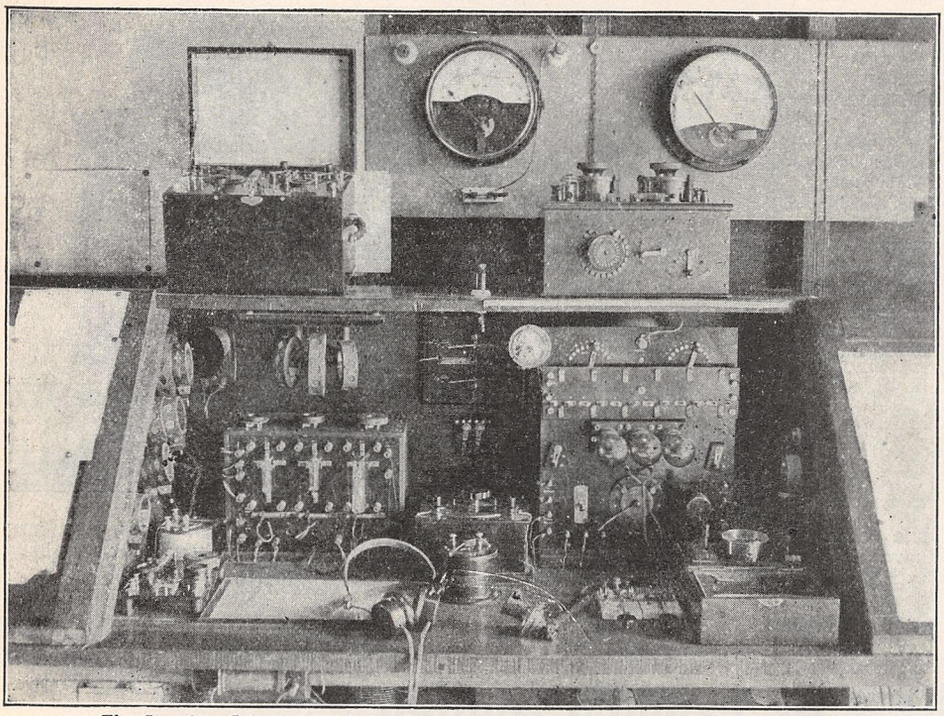
THE accompanying picture is of station 9BEE at Mounds, Illinois. The transmitter consists of an Acme one-half kilowatt transformer, four Murdock copper sheet condensers, a Murdock oscillation transformer, and a rotary gap. For the receiving set, there has been installed a Navy type long-wave lose coupler and receiver, a Murdock .001 variable condenser. A three-stage audio frequency amplifier is used with this long-wave set. There is also a short-wave receiver equipped with one step of audio amplification, and using a pair of Murdock-55 2000-ohm receivers. I am a regular reader of RADIO NEWS, and have seen many pictures of stations which have been in communication with mine. I would be very glad to receive a card from them.

FOREST F. SPENCER,
Box 404. Mounds, Illinois.

Here Is Another Fellow's Station That Is Equipped With a Rotary 'n' Everything, Including the Loose Coupler.

Amateur Wireless in Australia

By F. BASIL COOKE, F. R. A. S.



The Complete Self-Contained Receiving and Transmitting Station of Mr. Maclurcan, of Strathfield, Australia.

WORLD wide interest has been taken in the recent wonderful achievement of the American Radio Relay League in spanning the Atlantic. Not only will this feat go down in history as a remarkable scientific milestone, but will mark the beginning of a new era in wireless development. This test has demonstrated the fact that amateurs in one country can and will communicate direct with their brother experimenters in other countries. In this way it is only a matter of a little while when any amateur will be able to communicate with any other amateur in all parts of the world through the medium of their radio associations. Of course, in this way the development of this important science will be assured. It will be apparent to anyone that with world wide communication, universal peace and brotherly love will have a chance of graduating from an ideal to a practical reality. The rapid exchange of ideas and the common interest between the increasing numbers of wireless men and women must play a very important part in international politics.

Up to the present the general public has heard very little of what is being done by Australia in the radio field and it is with the object of supplying this information that the writer has taken for his subject the work recently performed by one of our leading experimenters, viz.: Mr. Charles Maclurcan of Strathfield, near Sydney.

Mr. Maclurcan has been devoting his energies to low power transmission and throughout all his tests he has never exceeded nine watts. He has designed his apparatus essentially to attain the greatest efficiency and his remarkable results are a just reward for the skill he has displayed both in the manufacture and design of his apparatus.

In order that his results can be fully appreciated, the writer wishes to here give a brief description of this station. A glance at the accompanying diagrams shows that the circuit employed is well known and reveals that the modulation is brought about by direct grid control. This method has been practically abandoned by many experimenters in favor of the valve system of modulation. It is, therefore, of interest to know that Mr. Maclurcan has demonstrated that for low power this simple inexpensive means of producing voice currents is equally efficient, if not more so, than the elaborate and expensive valve system.

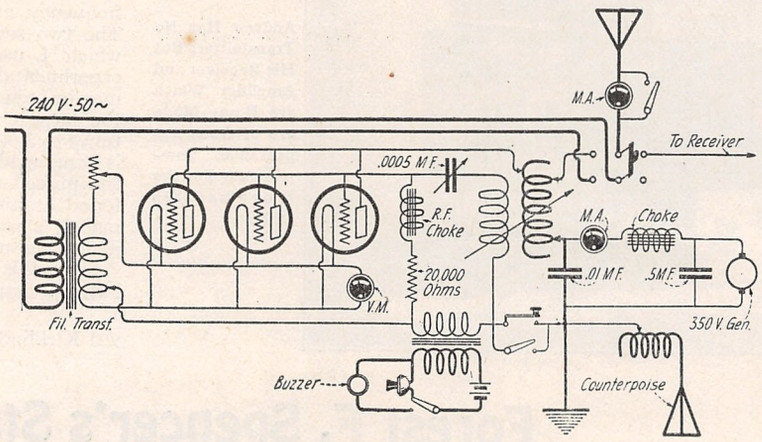
The actual apparatus and the assembling of it can easily be seen from the photograph, therefore little need be said in this respect. The transmitting valves are radiotron 5-watt power tubes, three of which are employed. The filament is only supplied with six volts instead of 7.5 in order that the tubes will have a longer life. The plate current exciting the tubes is drawn from a generator, developing 300 volts and passing 30 milliamperes, giving a maximum input current of nine watts.

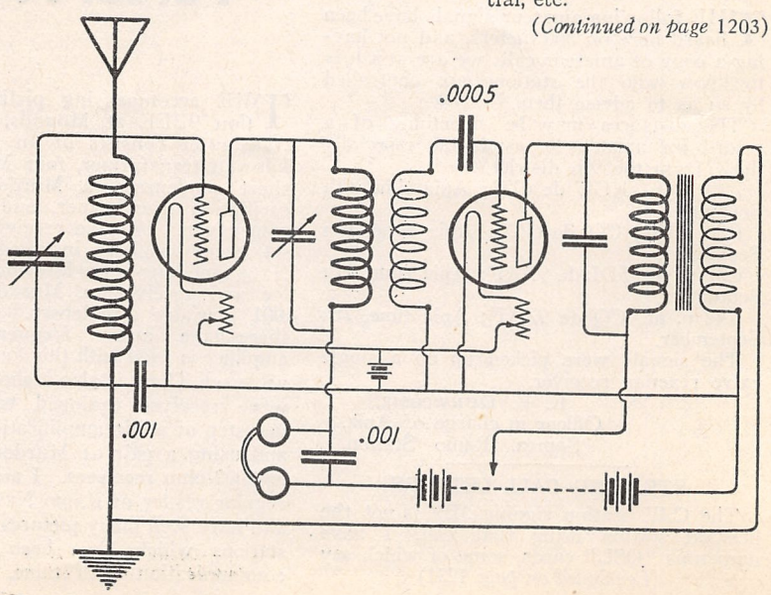
The aerial and earthing system deserve special mention. The aerial has been specially designed and consists of four 1-18th gauge copper wire equally spaced around wooden hoops 2′ 6″ in diameter. The hoops are placed 15′ apart. The two spans are each 100′. The center is fixed to an 80′ mast, while the two ends are supported by 25′ masts. The feeder consists of four 1-18th gauge copper wires on 12″ hoops. The natural wave-length of the aerial is 325 meters.

The earth system consists of a connection to a water pipe together with a balanced counterpoise. The aerial-counterpoise is very carefully tuned to the same wave-length as the aerial-earth system. With the inclusion of the counterpoise, the radiation is increased by 33 per cent giving a total radiation of from 1 to 1.2 amperes.

This description would not be complete without mention of the receiving portion of the station. As will be seen from the diagram, there are two valves grouped so that one acts as a radio and audio frequency amplifier passing the increased antenna current into the second valve where it is rectified and detected. From here the received signals are coupled back and pass into the first valve again which acts as an audio frequency amplifier. In practice, however, one valve only need be used to receive Nauen, Bordeaux, New York Central, etc.

(*Continued on page* 1203)





Above is the three-tube reversed feedback transmitting circuit, with which such remarkable work was done. On the right is the circuit of the receiver. The two valves are so grouped that ono acts as a radio frequency amplifier, another as a detector, the first valve acting again as an audio frequency amplifier.

Regeneration and Super-Regeneration

By JESSE MARSTEN

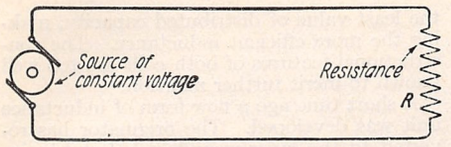


Fig. 1

Fig. 1.—A Circuit With a Source of Voltage and a Resistance.

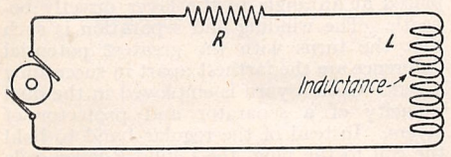


Fig. 2

Fig. 2.—The Same Circuit, in Which Inductance Has Been Introduced.

THE super-regenerative receiver recently disclosed by E. H. Armstrong has created a furor of excitement in the radio trade. It is the main subject of conversation, particularly among the newcomers and the very latest species of "radio experts." However, not only does investigation show that they do not understand the action in a super-regenerative receiver, but it also shows that there is a glaring lack of understanding of the action of simple regeneration.

The reason for this is these people are not grounded in the fundamental principles of electric circuits and have been overfed on popularizations which avoid mention of these principles. There is no royal road to radio knowledge. The kid amateur in a backwater town who operates his small spark coil and crystal receiver and who reads about volts, amperes, and ohms, stands more of a chance to understand super-regeneration than his modern brother, just entering radio, who spends several hundred dollars on the latest tube outfits and wants to hear the world. It is reasonable to expect that the man who understands the principles of oscillations in electric circuits is in a better position to understand regeneration than the one who never heard of the quenched gap. The desire to listen to Chicago talk via radio and to be up to date (which, in the minds of many newcomers and "radio experts," necessitates a

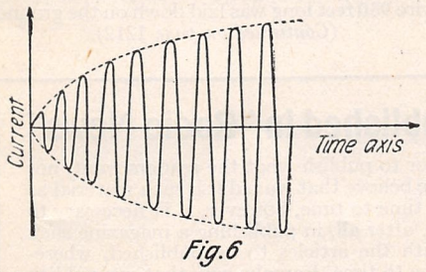


Fig. 6

Fig. 6.—How the Current (A. C.) Increases in a Circuit Containing Resistance, Inductance and Capacity.

certain contempt for anyone daring to speak of spark transmission) cannot take the place of a knowledge of fundamentals in understanding radio developments.

It is difficult to keep from stressing too strongly the importance of knowing fundamental basic principles. A knowledge of simple fundamentals will go much farther in clearing up such subjects as regeneration than all the sugar-coated popularizations invented. To say that in a regenerative receiver the amplification increases as the feed-back coupling is increased up to a certain point, and that beyond this point "*the tube spills over,*" thus destroying amplification, as so many popularizers say, may be perfectly clear to one who already understands regeneration; the writer fails to see where this sheds any light on the subject for the novice. It may seem easier to digest than an explanation involving the resistance reactions interposed by feedback coupling, but if values are to be measured by end results it is preferable to go to the trouble of learning something about resistance than to read about "tubes spilling over." These sugar-coated explanations seem to be devices for encouraging the radio newcomer to avoid thinking.

The following explanation of regeneration and super-regeneration is based on the action of resistance in circuits. It is not as easy reading, perhaps, as reading about "tubes spilling over," etc., but it is an attempt to present the fundamental electrical principles involved in an explanation of radio phenomena. It is an attempt to make the reader do a little more than simply read.

Fig. 1 represents an electric circuit containing a source of voltage, G, and a resistance, R. If the voltage is constant in value a current also constant in value will flow through the circuit and its value will be lim-

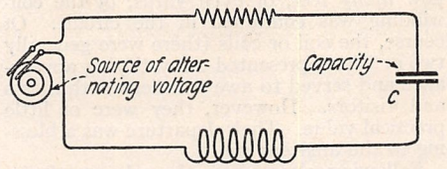


Fig. 5

Fig. 5.—Adding Capacity to a Circuit Excited by Alternating Voltage and Including Resistance and Capacity.

ited by the resistance. The smaller the resistance the greater the current and vice versa. In this case the current value is reached almost instantly. These are all elementary and well-known facts.

If the same constant potential is applied to a circuit containing resistance and inductance, as in Fig. 2, the current does not reach its maximum value immediately, but gradually rises from zero to its final value. The growth of current in a circuit containing resistance and inductance is represented in Fig. 3. The reason that the current takes some time to reach its final value is that inductance in an electric circuit behaves as an inertia and retards the growth of current. Such a circuit is said to have a "time constant" which depends upon the values of the inductance and resistance. This time constant is a measure of the length of time it takes for the current to build up to its final maximum value.

If in the above circuit there is a current flowing and the impressed voltage is removed, the current will gradually drop to zero according to some such curve as in Fig. 4. When the voltage is removed the current that is flowing has all its energy dissipated in the resistance of the circuit and, since there is no longer an impressed voltage to maintain this current, it dies down to zero. *The greater the resistance, the less time it takes for the current*

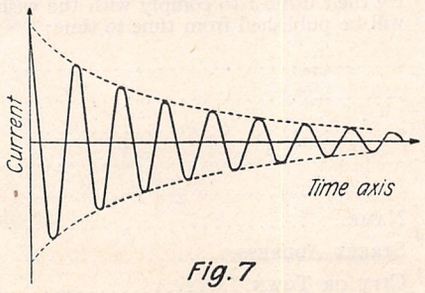


Fig. 7

Fig. 7.—Decay of Current (A. C.) in Circuit Containing Resistance, Inductance and Capacity.

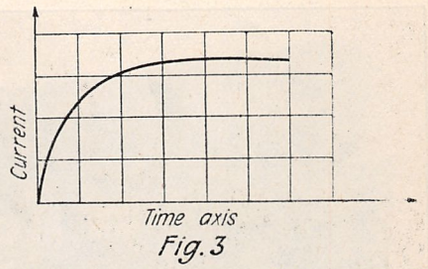


Fig. 3

Fig. 3.—Graph, Showing Growth of Current (D. C.) in a Circuit Containing Resistance and Capacity.

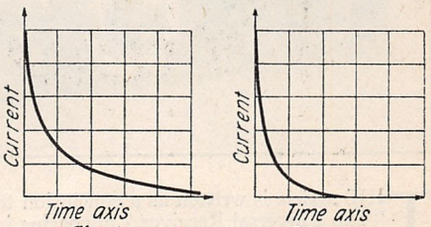


Fig. 4.—Decay of Current (D. C.) in a Circuit Containing Resistance and Inductance. Fig. 4 (a). Showing Highly Damped Current.

to die down to zero; the less the resistance, the more time it takes for the current to die down to zero.

Suppose that while the current is still flowing the resistance, by some means, is reduced to zero. What happens? At the instant the resistance is reduced to zero the current has a definite value. *Since there is now no resistance to consume the energy of the current and there is no resistance to oppose the flow of current, the latter will continue to flow in the circuit regardless of the presence of the impressed voltage.* If the impressed voltage is removed at the instant the resistance of the circuit decreases to zero, then the current will continue to flow at that value which it had at the instant the impressed voltage was removed.

Let us now consider oscillating current circuits, as in Fig. 5; namely, circuits containing resistance, inductance, and capacity. The principles and facts outlined above for direct currents hold here also, except with these changes: In the first place the current is oscillating or alternating. When the oscillating

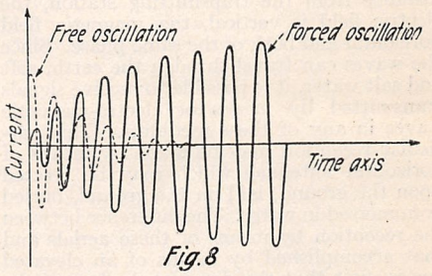


Fig. 8

Fig. 8—Forced and Free Oscillations Resulting from the Application of External Voltage to an Oscillating Circuit.

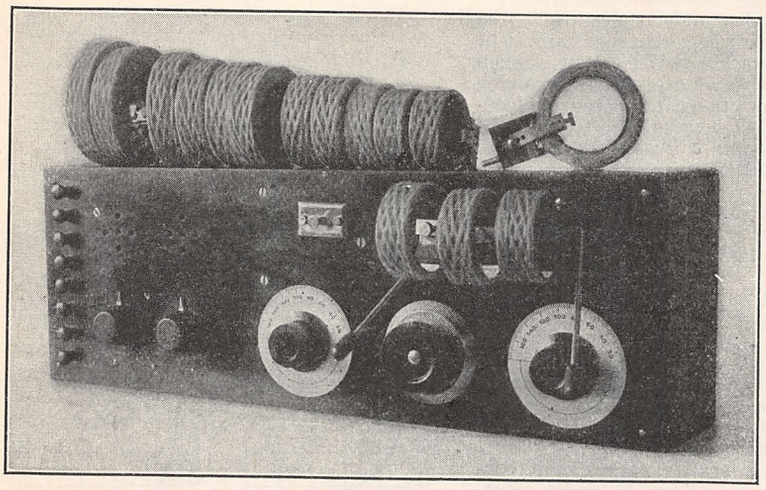
voltage is applied, an oscillating current flows and builds up in value as indicated in Fig. 6. As with direct currents, it takes appreciable time for the oscillating current to build up to its maximum value. The time it takes is again determined by the *time constant* of the circuit which in this case is determined by the values of the inductance, capacity and resistance.

This current which builds up in value when the voltage is impressed is called the "forced oscillation," since the existence of the current depends solely upon the presence of an applied external voltage. The frequency of this "forced oscillation" is the same as the fre-

(*Continued on page* 1162)

The Universal Receiver

By JOHN R. MEAGHER



With This Universal Tuner, Making Use of the R-G Coils, a Range of 150 to 20,000 Meters is Obtainable.

THIS article is written as a conclusion to "The Universal Receiver," appearing in the October, 1922, issue of RADIO NEWS. Data is given here relative to the proper sized coils for reception of short, intermediate, and long waves. The information is of special value to the constructors of the universal receiver.

UNIT COILS

The honeycomb coil was the first practical inductance unit employed for radio reception. It was a development of the plain multi-layered coil and was such a decided improvement upon that coil that it came into immediate favor with radio experimenters. Previous to the inception of honeycomb coils many amateur and commercial stations employed the bulky "stovepipe" coils. To denote one's wave-length, the amateur specified how many feet, or even yards, of the coil-winding was contained in the circuit. Of course, the coil or coils (there were generally two or three) presented a mystifying appearance and served to awe transient enthusiasts and visitors. However, they were of little practical value. Their departure was a blessing to the amateur art.

Following close upon the advent of the honeycomb coil, there was developed the duo-lateral inductance, which, until recently, was the last word in unit inductances. There is but slight difference in the external appearance of the coils, but the duo-lateral coil has the least value of distributed capacity, making the more efficient inductance. The constructional features of both coils are too well known to merit further mention.

A short time ago a new form of inductance unit was developed. The originator has reverted to the layer-wound coil, but has incorporated features which give the Giblin-Remler coil extremely low distributed capacity. In this unit each layer is wound in a plane placed at an angle to the layer directly beneath. The winding and separation is such that the turns with the greatest potential difference are the farthest apart in succeeding layers. Cotton yarn is employed in the dual capacity of a separator and protector of layers. Instead of the regular band to hold the coil to the plug, the Giblin-Remler coils have a metal strap, which is equipped with a pressure screw. This is a good idea, as the writer, from personal experience, can testify. In wet weather, the fibre straps on most coils become semi-conductors and from a practical short across the coil, or, if not a short, at least a low value of resistance which makes the coil aperiodic with resulting broadness in tuning. If the reader possesses such coils, it would be well to remove the bands, thoroughly shellac them and replace same, after which they will not absorb as much moisture.

THE PROPER CONNECTIONS

In wiring, the grid connection to the tuning inductance should go to the upper connection (relative) of the socket. The plate should go to the upper terminal of the tickler socket. If all coils are poled correctly, the set will operate properly when suitable sized coils are plugged in. It should be realized that, due

(*Continued on page* 1216)

Some Experiments with Low and Underground Antennae

By M. GUIERRE*

THE propagation of the waves on the surface of the earth was first studied by supposing that the ground was a perfect conductor and could be replaced by a reflecting surface reproducing under the level the exact shape of the wave radiated by the aerial. In this case and at a great distance from the transmitting station, the electric field is vertical, the magnetic field horizontal and both of the same phase. Since the waves can travel through the earth, soft and salt water, it is possible to receive signals transmitted by means of electro-magnetic waves in any of these mediums. This particular reception may be made by means of horizontal antennae which may be erected upon the ground, laid on the ground, buried or immersed in water. The difference between the reception by means of these aerials and that accomplished by means of an elevated one is, first that the directional effect of the horizontal part will be more marked, as the wire is nearer to the ground and as the conductibility of the latter is more imperfect. The second point is that low antennae give a very efficient protection against statics.

When these observations were made, they were considered of great importance, as the problem of static elimination was not solved to the extent that it is today, and even at the present time, it may be useful in some cases to use special dispositions in order to have good reception.

As far as we know, the first experiments by reception with underground antennae was made by Mr. Kiebitz and similar experiments were carried on in France, at the station of Saintes-Maries de la Mer by Mr. H. De Bellecsize, who wrote in 1915 on the possibility of the elimination of statics as the best point of this system, at least for the stations which have only a regular service. "It will be possible, undoubtedly, to get rid, entirely, of the statics by some special circuits which will have to be discovered, but up to the present time this is the only efficient method. As the tuning is very sharp, the new type of antenna presents advantages for the stations working with another, always in the same direction and at given hours." These conditions were precisely those of the traffic at the Ain-el-Turk station operated by the Navy in 1915.

The first experiments were made by the crew in charge of the station in August, 1915, during very hot weather and at a time when the statics were so bad that it was impossible to receive any signals. First, an insulated wire 930 feet long was laid down on the ground

(*Continued on page* 1212)

Lieutenant in the French Navy.

What I Would Like to See Published in "Radio News"

It has always been the desire of the Editor to publish what the readers want, not "what strikes the Editor's fancy." As a rule we believe that we publish such material as is of greatest interest to our readers. From time to time, however, it is necessary to check up to see whether our guess is right, for, after all, in publishing a magazine such as this, there is some guesswork connected with the articles to be published, wherefore we shall put it up to our readers from time to time, to make sure that we publish just what they desire.

On the blank space below, please list your preferences of certain articles, or class of articles, that you would like to see printed in this magazine. The Editors will try their utmost to comply with the wishes of the majority. The results of this work will be published from time to time:

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NAME.....

STREET ADDRESS.....

CITY OR TOWN.....STATE.....

Radiation From the Receiving Set

By C. L. WHITNEY

IS the Government going to find it necessary to require all receiving stations using an oscillating audion detector to be licensed? Will they find it necessary to require the persons who operate these receiving sets to pass the Government examination for an operator's license?

The United States radio law places a penalty of $500 maximum fine and confis-

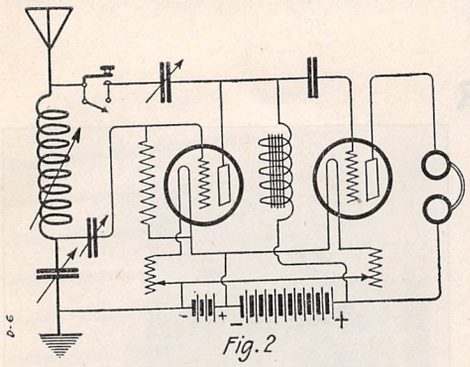


Fig. 2

Signals Produced by the Set of Fig. 1 Were Received on This Receiver Up to a Distance of 25 Miles.

cation of the apparatus, where a station sends out signals "The effect of which extends beyond the jurisdiction of the State or Territory in which the same are made, *or where interference would be caused thereby with the receipt of messages or signals from beyond the jurisdiction of the said State or Territory*, except under and in accordance with a license, . . . in that behalf granted by the Secretary of Commerce. . ."

Further, "It shall be unlawful to employ any unlicensed person or for any unlicensed person to serve in charge or in supervision of the use and operation of such apparatus, and any person violating this provision shall be guilty of a misdemeanor, and on conviction thereof shall be punished by a fine of not more than one hundred dollars or imprisonment for not more than two months, or both, in the discretion of the court, for each and every such offense."

Paragraph 202 of the Radio Regulations says: "Stations equipped to receive only do not require licenses." This is very well where the receiving station employs a crystal detector or some other method that does not cause radiation from the aerial, but every experienced radio man knows that a station using an oscillating audion as a detector, sends out "Signals" all the time the audion is oscillating. Most of us have not stopped to realize that this is a technical violation of the law, especially as the law states that amateurs may not emit signals on wave-lengths in excess of 200 meters (at present) except where the station has a special license for the higher waves.

Recently I had the pleasure of conducting a test to ascertain what distance the radiation from an ordinary receiving set using a Navy CW-933 receiving bulb (popularly known as a V.T. 1) could be heard under ordinary conditions of static and interference with another receiver using the same type of bulb.

Fig. 1 is a diagram of the first mentioned receiver. Note that no direct ground connection was used, the actual ground being the capacity effect of the set to the ground. The aerial consisted of a 4-wire T on 14′ spreaders 170′ long, with 70′ leads and an effective height of approximately 60′.

Fig. 2 shows connections of the observing station which had an L aerial of four wires on 14′ spreaders 200′ long, with 100′ leads and an effective height of approximately 70′.

Both receiving sets were oscillating and were adjusted so that a beat-note resulted in each pair of receivers. This was done while stations were 500′ apart. A break-in system was used in this manner: One station would send with his key. This would produce a beat-note in each station's receivers. When the receiving operator wished to break the sending operator, he just opened his key, thus stopping the beat-note from being produced. The sending operator closed his key and the other operator could then send. This is similar to the land telegraph systems. Both keys must be closed to produce a sound in the phones. When one key is opened no sound is produced.

Communication was carried out on wave-lengths varying from 950 meters to 7,200 meters, while the first station moved away from the second station, through interference from three different spark stations and two C.W. stations, and light to medium static up to a distance of 25 miles, strongest signals being on 1,025 meters at the observing station. At this distance the signals grew so weak that

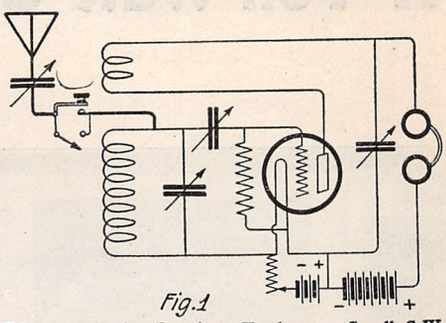


Fig. 1

Diagram of the Receiver Used as a Small C.W. Transmitter with the Detector Tube Producing the Oscillations. Note that No Ground Was Used.

the static covered the telegraphing, but the signals could still be heard faintly. The test ended at this distance.

Can anyone now say that his oscillating detector cannot interfere "With the receipt of messages or signals from beyond the jurisdiction of the said State or Territory?"

Supposing you have a station that is near one of the long distance commercial receiving stations, say one receiving traffic from Canarvon (MUU). You wish to listen to MUU. You tune your receiving set to his wave, or rather near his wave, your bulb oscillating so as to produce an audible note in your receivers. You are now sending out signals on a wave which may interfere with the commercial station which is receiving messages from Canarvon. If your station is not licensed to transmit signals on this wave, you are violating the radio law, in a technical sense, even though Paragraph 202 of the Radio Regulations does state that "Stations equipped to RECEIVE ONLY do not require

(*Continued on page* 1185)

Weather Forecasting by Radio

By EDMUND J. GUILLEMETTE

ASIDE from the official weather forecast given out daily by radio, the owners of receiving sets can very dependably predict the coming weather conditions for themselves by analyzing the reception of the broadcasts. Of course, to be able to forecast for two days or so ahead, one must have a receiving set that will bring in the broadcasts from a large area. A loop aerial, because of its directional qualities is especially desirable. The following information has been gathered as a result of continued observation with a set that receives in an area extending from Montreal to Anacostia and as far west as the Mississippi River.

Conditions of the atmosphere affect radio receiving far in advance of even the best barometers; for instance, lightning can be heard as a distinct clicking in the receivers a day or two in advance of thunderstorms. Perhaps it is not the same storm that ultimately appears, but when the clicking sound is heard the atmosphere is highly charged with electricity and conditions are favorable for thunderstorms in the near future. By noting the stations where the clicking sound is most distinct, a good idea may be formed as to the general direction the storm is approaching from, and when the direction is known the strength of the storm can usually be well calculated.

A thunderstorm approaching from the south or southwest is usually more of an electrical display and brings severe, dangerous lightning with heavy rain, but seldom is accompanied by hail or continuous high winds. These storms can be recognized by sharp, distinct snapping in the receivers at very close intervals.

Stations around New York City and New Jersey will be heard irregularly, if at all, being wavy in their reception and accompanied by crackling bursts of static. Western stations will come in better though slight clicking will be heard.

A warm southeast rain will produce a scraping sound in the receivers and will cause the same stations to be wavy, but will not have severe clicking unless some lightning is present. During the cool season an approaching warm wave will bring the same sounds as the warm rains, but rain accompanies these waves as a rule.

Storms coming up the Ohio Valley or from the Great Lakes region are usually preceded by a "freak" night when stations in the Middle West and Southwest are received as loud and clear as local stations. This seems to occur when a two or three-day rain is approaching and is due to the extensive area of low pressure traveling just ahead of the storm. These continued cold rains, although accompanied by northeast winds, approach mainly from the St. Lawrence Valley and Great Lakes regions, the northeast winds being caused by the air locally rushing toward the storm centers in the West.

During a warm rain the coastwise stations are received clearly owing to the atmosphere being in a uniform condition along the coast. The Western stations will not generally be heard until the approach of clear weather. The prevailing or clearing wind in this zone coming from the West, brings with it an area of high pressure. The atmosphere in this area will be of a uniform consistency and temperature and, therefore, will have the same characteristics as the low pressure area, with the exception of foreign noises. With a clear high pressure area approaching, reception from the West becomes clear and distinct once more and all is well until the approach of another disturbance.

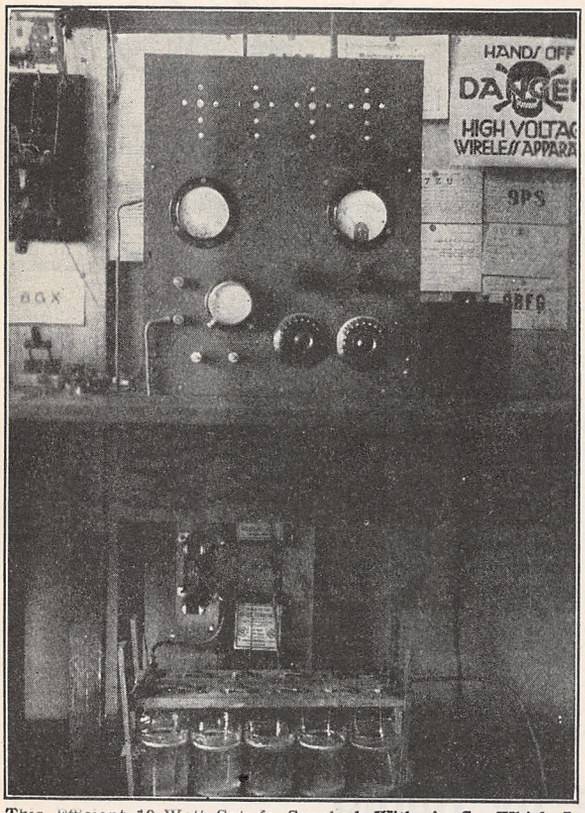
Northwest thunderstorms consist mostly of unusually strong, cold winds with rain and in most cases hailstones. They have

(*Continued on page* 1188)

The Radio Constructor

A Ten-Watt Set With a 1,000-Mile Working Radius

By EVERETT W. THATCHER



This Efficient 10-Watt Set Is Supplied With A. C., Which Is Rectified for the Plate Circuit Through the Electrolytic Rectifier Under the Table.

THE relay season of 1922-23 is upon us with its crystal clear cold nights. Transcontinental work is becoming frequent and immense volumes of traffic are being handled. One great advance in the art of radio transmission has made this possible—the increasingly great number of amateurs who have installed continuous wave transmitters.

During the last 12 months, C. W. has proven, once for all, its superiority over spark as a means of amateur communication. Yet there are still many who cling to the latter method of transmission, either because of the difficulty experienced in securing results from tube transmitters, or because of the expense necessarily connected with the change.

The enormous advantages of C. W. are well known by most amateurs. We know the great decrease in interference resulting from its use; we know that no trouble is experienced from noise, blinking of lights, or burning of fuses. We know too, that watt for watt, C. W. will work rings around a spark transmitter of much greater input.

The purpose of this article is to give accurate constructional and operating data for a low power C. W. set, which, with a little care in construction and adjustment will produce remarkable results.

The 10-watt set in use at the author's station, 6AWP, has been reported many times over 2,000 miles, and consistant work has been carried on with stations 1,000 to 1,500 miles distant such as 9WU, 9ZAC, 7ZU and 7LU.

Fig. 1 shows the writer's arrangement of the instruments on the panel, and also the rectifier and filter system mounted below the table. Figs. 2 and 3 show the side and back views, respectively, of the C. W. transmitter. The circuit employed in this set is shown in Fig. 4. It is what is known as the Colpitts circuit, and it contains the series condenser in the ground lead which produces the capacity feed-back. The grid and filament terminals are connected across this condenser.

Starting with the 110-volt 50- or 60-cycle A. C. power supply, now available in most homes, the current is "stepped-up" by a suitable transformer. The Acme 200-watt is fine for this purpose, but one may be constructed at considerably lower cost, with two secondary windings of 550 volts each, and a tertiary winding supplying about 10 volts for the filaments.

The chemical rectifier, a source of trouble to many experimenters has been used without the slightest difficulty. The following points should be carefully regarded for best results:

1. Only the purest lead and aluminum obtainable should be used.

2. The electrolyte should be made of *distilled* water and 20 Mule Team borax (not soap chips). To insure a saturated solution, warm the water and dissolve as much borax as possible. Then allow the solution to cool. The excess borax settles at the bottom of the vessel, and the clear saturated solution may be poured off.

3. Mix up sufficient electrolyte for all jars at once and add distilled water as it evaporates.

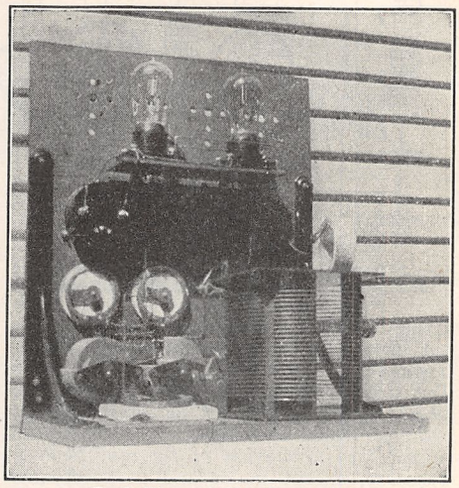
4. Use one jar for each 50-60 volts.

Using five cells on each side, as shown in the circuit diagram, no trouble is experienced from heating, when 3 x ½-inch surface is immersed in the solution. Ordinary jelly glasses are used as containers.

The electrodes are bolted together, "U" shaped, and slipped through holes bored in a wood crosspiece, which suspends them in the liquid. In this way, they do not touch the crystals which form in the bottom of the glass, and also they can be raised or lowered at will, until the best operating surface is determined.

The filter system consists of one Acme 1½-henry choke in the negative lead, on each

(*Continued on page* 1200)



Back View of The Transmitter.

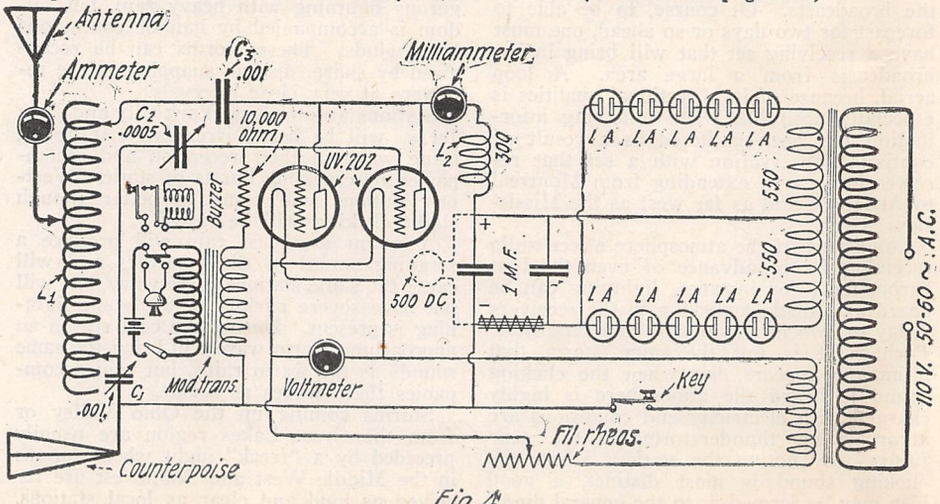


Fig. 4

Complete Diagram of 6 AWP CW Set. Its Owner Has Had Excellent Results With This Circuit.

A DX Amateur Concert and Commercial Receiver

Regenerative Type With Three Stages of A. F. Amplification
Wave-Length Range 150 to 1400 Meters

By F. B. OSTMAN, 2 OM

THE regenerative receivers and amplifiers that have been described in various magazines of late have been for the novice and with an idea to economize on parts, etc. It is surprising what a much better set can be assembled with a few extra dollars, a little time and careful workmanship.

Many amateurs, after they have gone through the days of simple crystal sets and one-bulb outfits, look forward to having a compact set, efficient on amateur waves and to cover all wave bands, including a few of the higher commercial waves, sufficiently powerful to operate a loud-speaker, or the desire for signal intensities loud enough for dancing or concerts, where music must be heard through a large room.

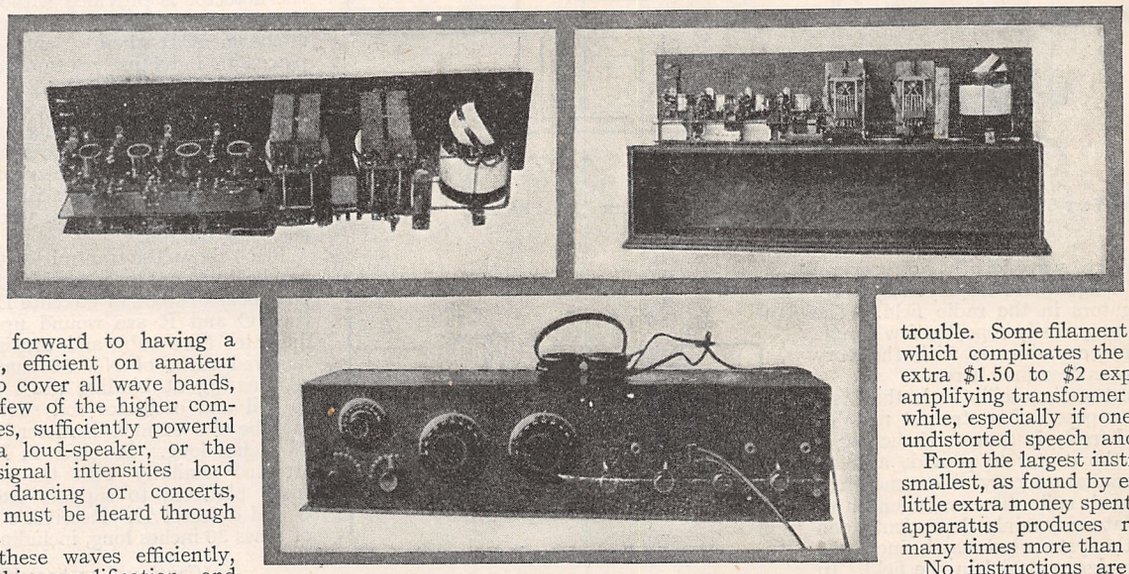
To cover these waves efficiently, to obtain this amplification and maintain the original quality of the signal it is necessary to observe a number of precautions in the selection, construction and operation of the apparatus.

Having had a number of years' experience with sets of home-made construction and used some of the best amateur apparatus manufactured, we decided on the construction of a complete receiver and amplifier along our own ideas.

The set to be described was on exhibition at the 71st Regiment Armory Radio Show, N. Y. City, May 22 to 27, 1922, and was awarded Third Prize of $50. A number of improvements have been added since, after some careful tests and experiments were made.

To make a neat appearing set a little thought must be given not only to the appearance and design, but the placing of instruments from a practical standpoint in wiring up.

On the set described the rheostats, inductance switches, coupler dial and binding posts are of similar design, having a sloping knob; this uniformity adds much to the appearance.



Top, Back and Front Views of the New Type Receiver.

A list of material, apparatus and parts used in construction and the approximate prices is given at the end of this article.

It is possible, with a little care and workmanship, to make the variocoupler and variometers, but the prices for these well made instruments are low enough, considering the time involved in construction one saves by buying the ready-made instruments. There are a great many variocouplers and variometers on the market to choose from, but those costing a couple of dollars less are worth nothing, as they are poorly designed and constructed and do not reach the desired wavelength, which should be about 600 meters.

There are a few good rheostats on the market which can be purchased for as little as $1 each. When purchasing, one should be able to judge the good and bad points about the apparatus. The same applies to sockets; it is much better to pay 50 cents more than to take some composition thing for $1 which will melt when you solder up your set, if you get the iron within 6" of it.

Use only standard jacks and stay away from the trouble. Some filament lighting type, which complicates the circuit. An extra $1.50 to $2 expended on an amplifying transformer is well worth while, especially if one wants clear undistorted speech and music.

From the largest instrument to the smallest, as found by experience, the little extra money spent for the best apparatus produces results worth many times more than the saving.

No instructions are given as to design, construction and wiring, as builders usually follow ideas of their own on changes in these points.

As can be seen in the photograph, No. 1, two Federal anti-capacity switches mounted on the back of each variometer are used for series parallel connections. (These can be mounted as shown or may be mounted so as to operate from the front of the panel). Mounting them as shown was done because this secures the shortest length of leads; however, it is necessary to raise one side of the cabinet cover in order to change the switch. This is no trouble because the switch is not used very often, being, in our case, mostly set in the parallel connection for amateur stations.

For short waves, amateur length, the switch handle is thrown to the left as can be seen in the diagram. This connects the coils in parallel, which is ideal for tuning amateur stations. It is particularly desirable when tuning for C. W. stations, many of which are so sharp they are passed over when tuning with the variometer in the usual series connection. The parallel connection allows better tuning on lower waves, which large variometers with series windings can not get down to. The same parallel connection on the plate variometer allows a more gradual control of regeneration.

It will be noted that with a series connection on a grid variometer having sufficient inductance to cover waves up to 600 meters, amateur stations

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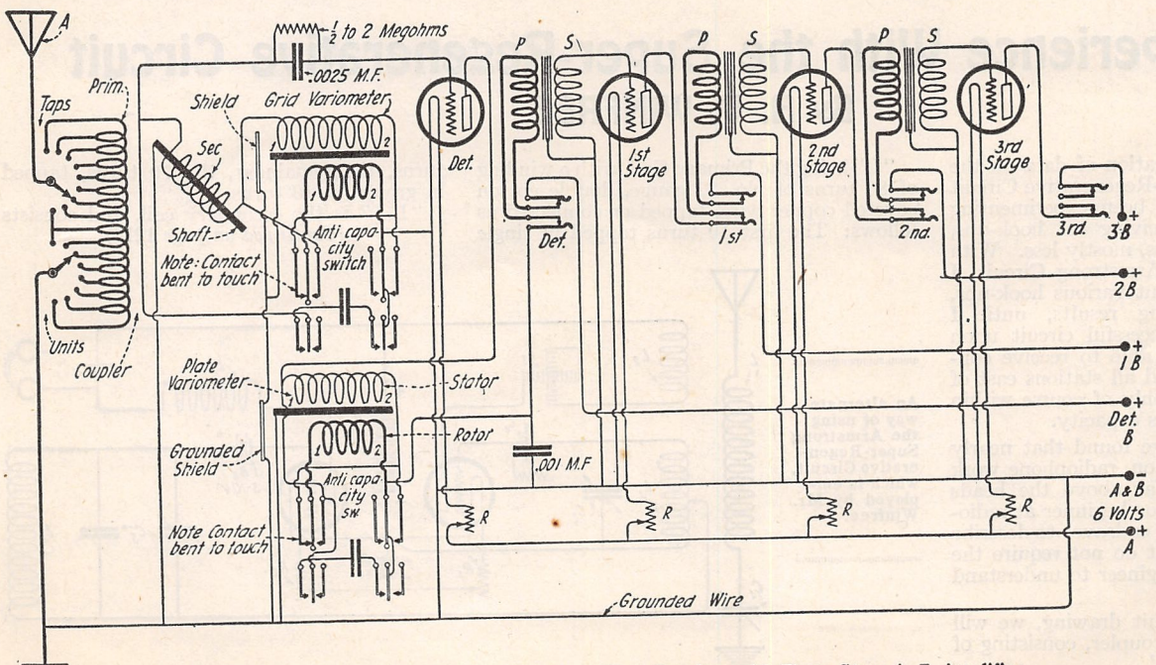

Complete Diagram of the Short and Medium-Wave Receiver with Three-Stage A. F. Amplifier.

Some Experiments on Very Short Waves

By D. R. CLEMONS

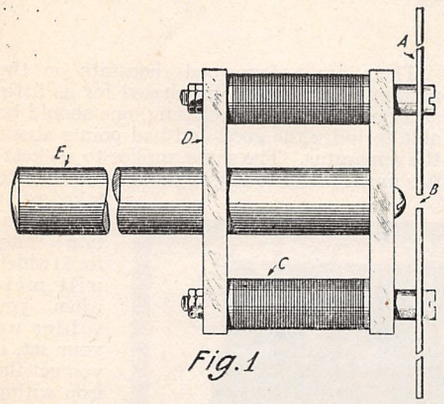

Fig. 1

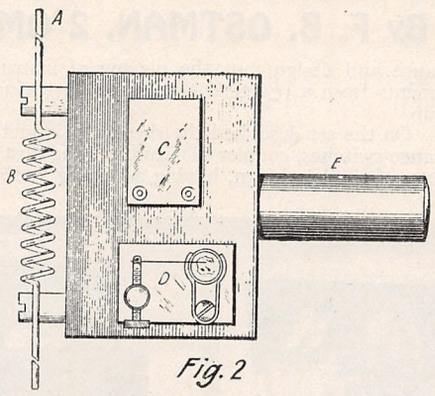

Fig. 2

For Very Short Wave Work, a Special Receiver and Transmitter Must Be Used. Both Are Shown in This Drawing.

VERY short wave-lengths of several meters' length were employed by early investigators in the radio field. The experimenter may easily repeat a few simple and instructive experiments with the very simple apparatus described here.

The simplest radio oscillator is the open lineal type composed of a straight metallic rod suspended freely in space. If the rod is separated at the center to provide a small gap, it may radiate energy when energized by a small spark coil. The wave-length of such an oscillator is mainly dependent upon the length of the system, but may be increased slightly by foreign material in the field. In the ideal lineal system the energy distribution is such that the wave-length will be twice the length of the oscillator, but since this is only true for a rod free in space, necessary leads to spark coil, mountings, detecting devices and phones all tend to increase the wave-length considerably. Therefore, it may be necessary to tune the receiver to the transmitter by accurate adjustment of length.

Fig. 3 shows the diagram of the transmitter. A straight rod is divided into two sections of equal length, adjacent ends being separated by a small air gap, or "spark gap." A small spark coil C is connected through two small choke coils R to the rods. The coil energizes the rods; one positively and the other negatively until the gap breaks down, after which the energy becomes oscillatory until damped

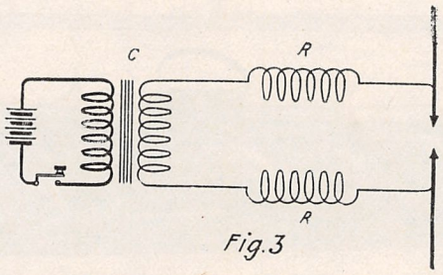

Fig. 3

How the Transmitter Is Connected.

out. Chokes R prevent the capacity between leads and coil from becoming effective by retarding high-frequency currents tending to move back into that circuit.

Figs. 2 and 4 are of the receiving unit. Since this must be tuned to the transmitter, its length will be approximately the same except that the rod is continuous and undivided. The problem of detecting received energy is quite great since the energy at a distance is very small and the addition of extra apparatus in circuit prohibitive. The rod being open makes it difficult to obtain sufficient potential to operate detectors. Three schemes are shown in Fig. 4, all of which possess some advantages when used with certain lengths of receivers. However, the scheme at D and in Fig. 2 is simplest and most effective for spark and crystal reception. The exact center of the rod includes a very small helical coil of several turns across which is a small fixed condenser of 500 m-mfds and crystal detector as shown in Fig. 4 D. The potential distribution is maximum at the extremes of the coil during reception, and is, therefore, zero at the center, so by employing this small coil, a sufficient drop to operate the detector is provided without destroying the effect as an oscillator. Another scheme is shown at B where a small inductance is placed in inductive relation to the current antinode of the oscillator. B is a rectangular block of wood supporting 30 turns of No. 30 enameled wire, the terminals being connected to the detector unit. One side is placed to the rod as shown. Another coil is shown at C, consisting of a wooden ring with toroidal winding of 30 turns of No. 30 enameled wire enclosing the rod.

Fig. 1 shows the transmitter; E is a wooden handle 10 inches long, carrying two rectangular blocks of wood or bakelite D. Two choke coils C and R are wound upon a ¾-inch diameter fibre tube and consists of several hundred turns of No. 36 enameled copper terminating at binding posts for attaching to coil and oscillator rod shown. Rods A may be of 3–32-inch diameter brass rod each 18 inches long. Receiver in Fig. 2 is constructed similarly with the addition of a small platform to support fixed condenser C and detector D. Receiver's rod A is also of brass 30 inches long, including coil B.

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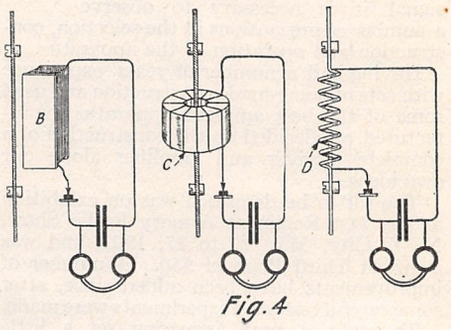

Fig. 4

Various Ways of Connecting the Receiver.

My Experience With the Super-Regenerative Circuit

By H. V. WINFREE

PRIOR to the publication of data on the "Armstrong Super-Regenerative Circuit Hook-up," I had been experimenting with a number of receiving set hook-ups, with more or less success, mostly less. With this new data on the Armstrong Circuit, I went to work, trying out various hook-ups, some with discouraging results, until I finally completed a successful circuit upon which I am at present able to receive concerts, etc., from any and all stations east of the Mississippi River, only of course within the range of my circuit's capacity.

In my opinion, I have found that nearly all the articles written on radiophone work and related data are far above the heads of the average layman or beginner at radiophone work, hence I will endeavor to describe my circuit in terms that do not require the knowledge of a radio engineer to understand them.

Referring to the circuit drawing, we will first consider the loose coupler, consisting of coils "L," "L-1," "L-2."

"L" being the Primary Coil, with a winding of 80 turns of No. 22 gauge, double cotton covered copper wire, tapped or connected as follows: The first 10 turns tapped in single turns, the remainder, the 70 turns, tapped in groups of 10 turns.

"L-1" is the secondary coil, and consists

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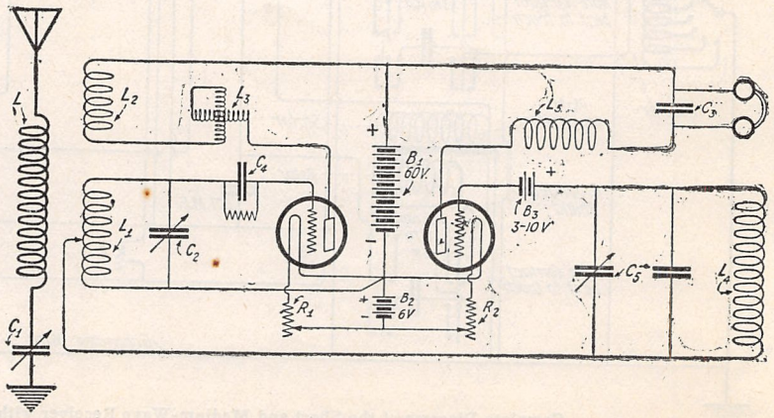


An alternate way of using the Armstrong Super-Regenerative Circuit, which is employed by Mr. Winfree.

Low-Frequency Transformers for Radio Reception*

By CAPTAIN H. DE A. DONISTHORPE

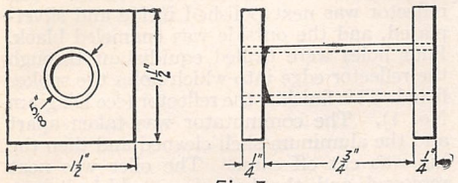


Fig. 3

The Forms for the Three Step Audio Frequency Amplifier Transformers Are Made Of Hard rubber From Dimensions given in Fig. 3.

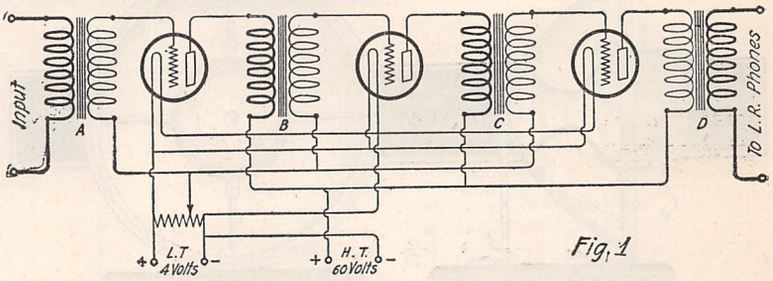


Fig. 1

IN all the modern-day radio receiving apparatus thermionic valve practice is now general, and where reaction circuits are not adopted some form of amplifier is employed. There are two kinds of amplifiers, the high frequency and the low frequency, and in this article it is our intention to deal with the latter named. Low-frequency amplifiers are employed for the purpose of magnifying up radio signals after they have been rectified by means of some form of detector, either valve or crystal. In other words, the audible or low-frequency signals are magnified, and for this reason this type of amplifier is sometimes known as a "note" amplifier, and can well be used for the purpose of increasing the volume of ordinary telephonic speech. The general type of low-frequency amplifier is that where inter-valve transformers are employed. Fig. 1 shows a typical three-valve L.F. amplifier circuit, and for the benefit of amateurs who are intending the construction of such an instrument we will deal solely with the transformers utilized in the circuit, leaving the general wiring and mounting to their own discretion.

From Fig. 1 it will be seen that there are four different transformers employed, A, B, C and D, of which B and C are identical and only serve as couplers between the two valves, and are consequently called inter-valve transformers. If there were four valves a further transformer similar to B and C would be used between the third and fourth valve. The transformer A has a variable primary, so that it can be adapted to the circuit with which it is to be employed. The transformer D is the valve-to-phone transformer and is used to convey the energy of the amplifier to the telephones; this can be dispensed with and the telephones inserted directly in the anode circuit of the last valve, but is not desirable by reason of the fact that the H.T. battery is connected in that circuit and may cause damage to them.

Type	Primary	Secondary
A*	300 ohms 600 ohms 1,200 ohms 2,000 ohms	4,000 ohms
Inter-Valve†	400 ohms	2,000 ohms
Valve-to-phone‡	120 ohms‖	5,000 ohms

*The primary has a series of tappings of resistances shown.
†B and C in Fig. 1.
‡D in Fig. 1.
‖According to value of telephone resistances.

The table, which is given in Fig. 2, will show at a glance the values of the windings of the transformers, and in this connection it should be noted that as a general rule the low-resistance windings are the primaries and the high-resistance the secondaries.

Fig. 4

How the Iron Core of the Low Frequency Transformer is Bent Back On Each Side To Form A Closed Magnetic Circuit.

The transformers should be wound on ebonite formers of the type and dimensions shown in Fig. 3. They consist of an ebonite tube 2¼ inches in length and about ⅝ inch in diameter, fitted at each end by ebonite squares 1½ by 1½ inches and ¼ inch in thickness, and secured in position by Chatterton's compound.

The primary winding is then wound on the former, preferably by means of some mechanical device, such as a lathe (or by hand), the two ends being brought out clear through holes in the ebonite former's sides, and each distinctively marked "primary" by means of suitable tabs. When the correct winding has been made it should be covered by means of a sheet of "Empire" cloth or other insulating material and the secondary then wound over the primary, taking care that it is wound in the same direction as the primary; the ends also being brought out through the sides, and marked with tabs.

The winding should be made with single silk-covered wire of No. 44 S.W.G., this wire having approximately a resistance of 1 ohm per foot, it is consequently an easy matter to measure out the correct windings.

As the transformers are for low-frequency work iron cores will be necessary, and these can be made by inserting a bundle of soft-iron wires through the ebonite tube and bending them back on each side after the fashion shown in Fig. 4. The wires should be cut into lengths of about 6 inches and each lacquered to prevent eddy currents and consequent loss of energy. Special "Stalloy" wire can be purchased for this work, and is admirable for the purpose as it does not retain residual magnetism while the transformer is in operation.

The core should be finished off by binding the same round with silk.

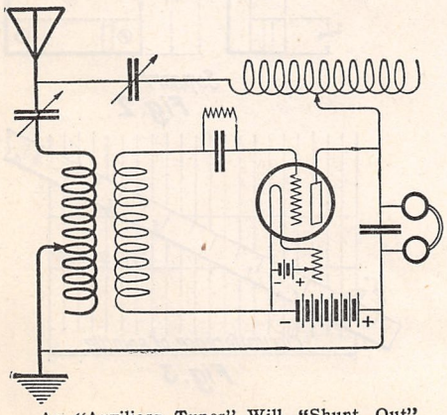
The ends of the windings should be carefully connected to terminals in order to obviate any chance of the two wires breaking internally where they come through the ebonite sides.

In the case of the transformer A, where there is a variable primary, the tappings should be brought out to a suitable switch.

**Abstract from the Model Engineer and Electrician.*

How to Tune Out That Other Fellow

By JEWELL WILLIAMS



An "Auxiliary Tuner" Will "Shunt Out" Interference.

THE good old saying, "Necessity is the mother of invention," is living up to its reputation with me.

I was bothered by a well-intentioned but bothersome (to me) neighbor who is a 200-meter amateur. Invariably, when I was enjoying some broadcasting to the utmost on a 360-meter wave, in he would come on his 200 meters, and due to the close proximity of his set—about one-quarter mile—I would get his endeavors to wake up other amateurs, in place of the music which was soothing me to repose.

How to overcome this was an enigma until I hit upon the happy idea as disclosed in the diagram printed on this page.

The principle is to shunt him out. Now, if we have a two-circuit set (as in this case), what we do is to use our inductance and variable condenser to tune in whatever objective we desire. We will take for an example a 360-meter broadcast. Everything is going along beautifully, when, buzz-buzz-etc., comes in to spoil it all. He is sending on a 200-meter wave-length, but due to close proximity he seemingly overlaps the length.

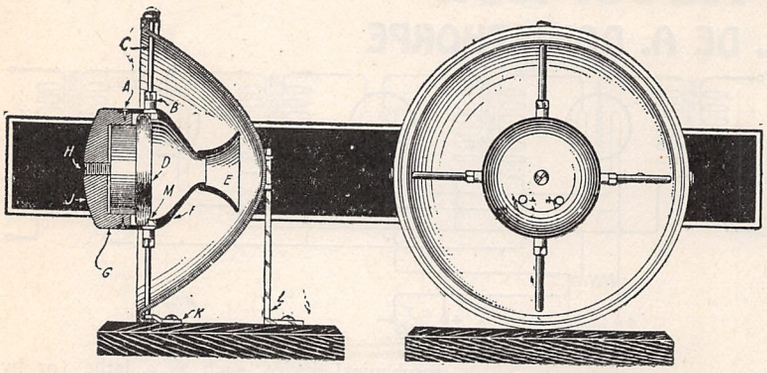
This is overcome by tapping off from the antenna to a single circuit tuner consisting of a variable condenser and tapped inductance coil in series, from which you run to the plate side of the receiver condenser. From the other side of the fixed receiver condenser you run to ground.

Now, when this auxiliary tuner is tuned to his wave-length, the vibrations he is sending will travel over the shunt circuit to the ground, and as they are not audibly transformed in the detector bulb you will not hear them.

Under certain conditions and with proper auxiliary tuner, static may be eliminated.

A Radio Sound Intensifier

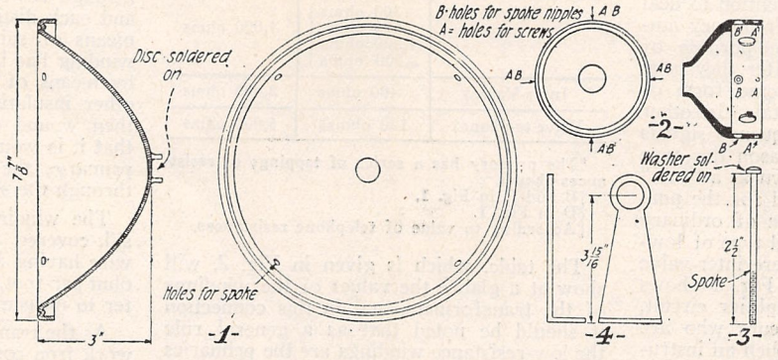
By JOHN G. MERNE, I.M.T.



With Such a Sound Reflector, Signals Are Audible All Over a Room, Provided They Are Loud in the Telephones.

THE following description of a useful as well as ornamental, piece of apparatus for the radio amateur is of a sound intensifier, which the writer constructed for a friend at a cost of a few pence, and may be of interest to the readers of RADIO NEWS. All the material can be readily procured for practically nothing at any motor garage.

The writer happened to visit a friend's garage and in the junk box discovered an old discarded front light reflector from a Ford car, an old aluminum commutator from same, a broken rubber bulb from a motor horn and some motor-cycle spokes with nipples attached. These were obtained free of cost and brought home.



The first procedure was to clean off all grease from the reflector. The flat flange at the broad end of the reflector was next cut off and the surface made smooth. This left the two beads on the edge as the finish. The hole in the center of the reflector, through which the socket of the lamp passed, had a small flat disc of copper soldered in. The reflector was next polished inside and silver-plated, and the outside was enameled black. Four holes were drilled equidistant through the reflector edge into which holes the spokes fitted. This finished the reflector (see Diagram No. 1). The commutator was taken apart and the aluminum shell cleaned and then the lug was cut off same. The oiler was next removed and the hole from which it was taken was countersunk inside and outside and in this hole a plug of soft aluminum was fitted and riveted over so as to fill up the hole. All roughness, both outside and inside, was removed with a file and scraper. A block of wood was then turned on the lathe to fit into the broad end of commutator casing. The outside of the commutator was then turned smooth and a hole bored in end of the cone; this was turned out, leaving a thin tube projecting. Four equidistant holes were bored near the broad end of the cone on the flat surface of the commutator, into which the spoke nipples fitted and were countersunk on the inside to suit the heads of the spoke nipples and these were filed flat, so that when in place the surface inside the commutator shell would be smooth. Four equidistant holes were bored ¼ inch from the flat edge of the shell (to take four small screws) and countersunk on outside.

(*Continued on page* 1220)

Hand-Winding G-R Solid Wire Inductance Coils

By T. MORSE LLOYD, B. Sc.

TO wind the new type of solid wire inductance coils, make a winding device as shown in Fig. 1. The individual parts of the device are shown in Fig. 2. The winding device will take a little time to construct, but once built, it will serve for any number of coils. The spindle consists of a turned piece of close grained hardwood dimensions of which are given in Fig. 2. (A dowel forced over a ½-inch shaft can be used in lieu of a turning, but will not be found as satisfactory.) Lay out two parallel markings 1 inch apart around the circumference of the spindle. Wind a strip of paper 15/16 inch wide around the spindle to get its true circumference and divide this length into 21 equal parts.

This can most easily be done by pinning the strip of paper to a larger sheet of paper thumbtacked to a board. At the ends of the strip draw two lines, as shown in Fig. 3. Across the lines lay a rule so that the 1-inch division and the 7 9/16-inch division coincide with the lines, then lay off every 5/16 inch along the rule. Draw lines parallel to the end lines through the points and across the paper.

Re-wind the strip of paper on the spindle and prick point the 21 divisions on the two parallel lines. Drill at each of these points to a depth of ¾ inch with a 1/16-inch or smaller drill. Insert pieces of steel wire 2¼ inches long. The diameter of the wire should be such as to fit tightly in the holes. Before inserting the second row slip a piece of 1/16-inch fibre or cardboard tubing 2 inches in diameter and 15/16 inch wide over the spindle. Place the spindle in its supports and insert the handle.

(*Continued on page* 1223)

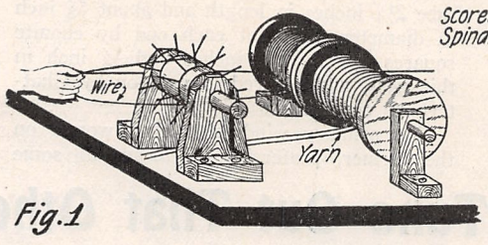


Fig. 1

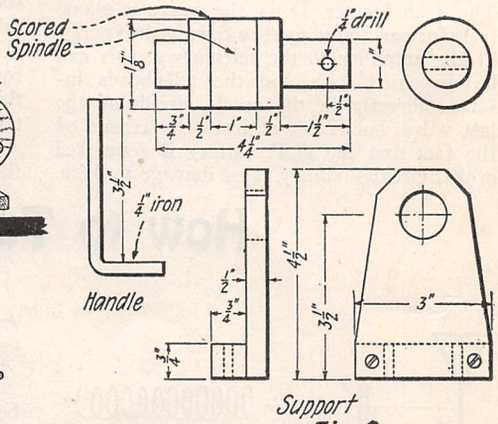


Fig. 2

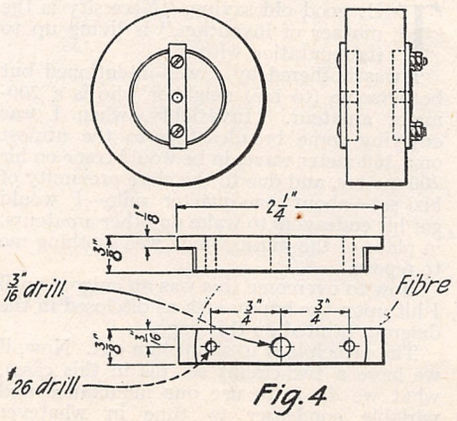


Fig. 4

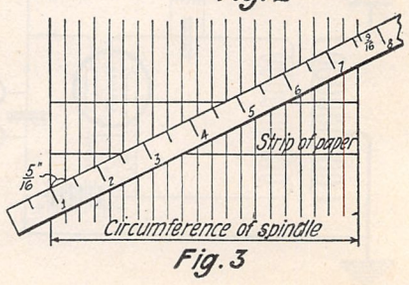


Fig. 3

With Patience and Time It Is Possible to Make Some G-R Coils. Here Are Given the Construetional Details

An Efficient High Frequency Buzzer

By D. R. CLEMONS

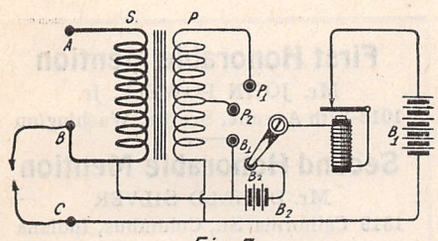
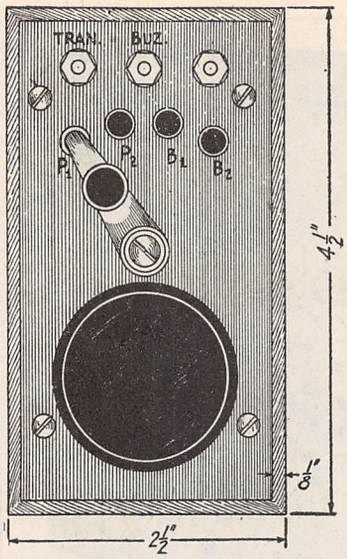
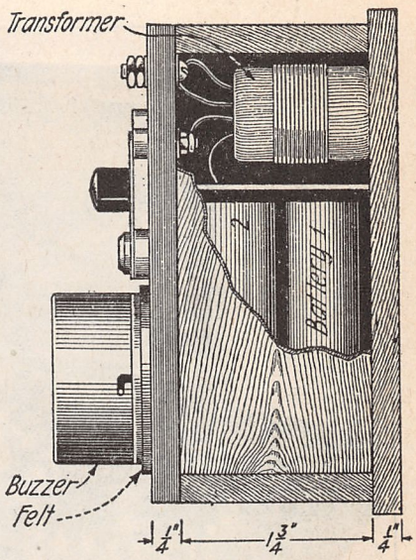


Fig. 3



With a Constant Frequency Buzzer Such as This One, It Is Easy to Conduct Tests in Frequency, Capacity and Inductance Measurements. The Diagram of Connections Is Given at the Left.



IN the experimenter's laboratory measurements of frequency, inductance and capacity with other investigations are carried out by means of a wavemeter. In this connection, the wavemeter may be excited and adjustments made by connecting a receiver and detector to the circuit under test, or the test circuit may be excited and detection made on the wavemeter. Two readings may be taken, one by exciting the circuit and then by exciting the meter; invariably there is considerable difference. One appreciates a reasonable degree of accuracy in such work, but it is not common for one to take caution in considering the additional capacity of the excited circuit. It is true that such changes as noted above are not great, but in some cases even a small error cannot be tolerated. The capacity of the exciter should always be known and considered in calculations.

Circuits are generally excited by means of a buzzer and several cells of battery. One cell may operate through small inductances, but several batteries may be required if the inductance coil is large. Now, the leads attached to the system possess considerable capacity, also the cells of battery. Such capacity is in shunt to the standard condenser in the test circuit, which results in greater capacity than is accurately known. Too, the capacity of a buzzer test of this sort is rarely the same for two different circuits, due to other arrangements of instruments. It would be desirable to employ a buzzer exciter of fixed dimensions and capacity that would not vary. Such an instrument will be briefly described and shown by the accompanying sketch.

As a large battery is often required, two

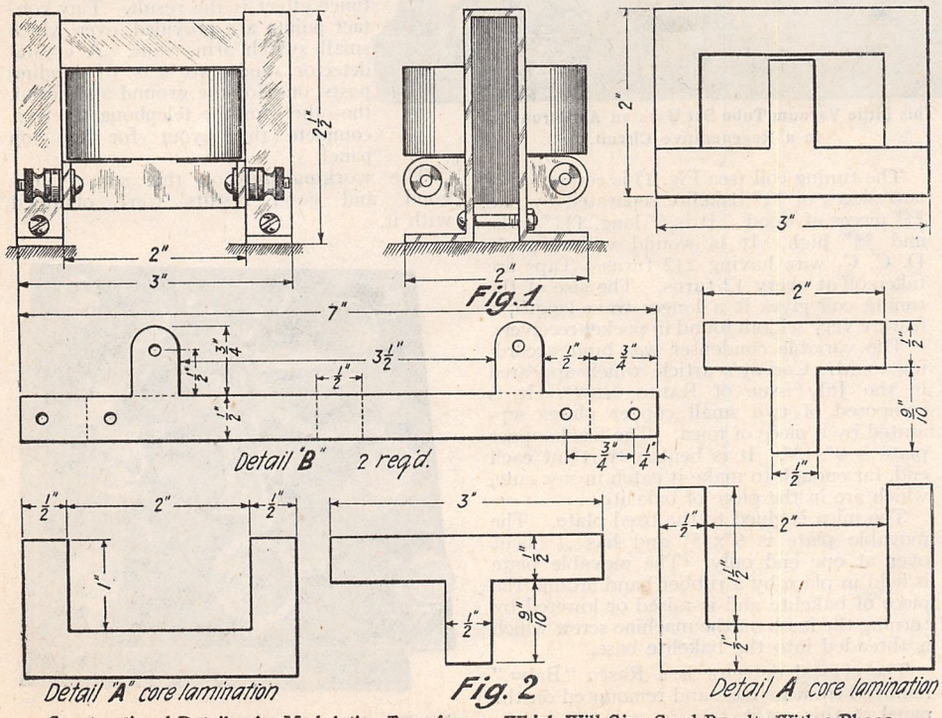
(*Continued on page* 1208)

Construction of a Modulation Transformer

By CHARLES K. FULGHUM

THE use of a properly designed and well-constructed modulation transformer in radiophone transmitting circuits is the most efficient and practical method of modulating the output of the transmitter at voice frequencies.

Modulation by the absorption method is excellent—when it works—but it demands an excellently balanced circuit, and is always a source of loss of more or less of the output energy. The same is true of inserting the microphone directly in the antenna circuit, and to a certain extent, when modulation is accomplished through the agency of impedence devices placed in the antenna circuit, i. e., magnetic modulators, etc. In the former case there is soon reached a limit to the amount of energy that can be handled, while, in the latter, by using properly designed instruments, almost unlimited energy may be modulated with but little distortion.



Constructional Details of a Modulation Transformer Which Will Give Good Results With a Phone Set of Any Power.

Modulation by modulation transformer methods calls for the use of properly designed transformers. Induction coils of various sizes are often used for this purpose, but they are at the best but makeshifts, and the results obtained are convincingly unsatisfactory.

The modulation transformer has affected a number of designs, but the one described in this article has proved as satisfactory as any. Moreover, it is very easily and cheaply constructed.

The materials needed for the construction of the modulation transformer herein described are as follows:

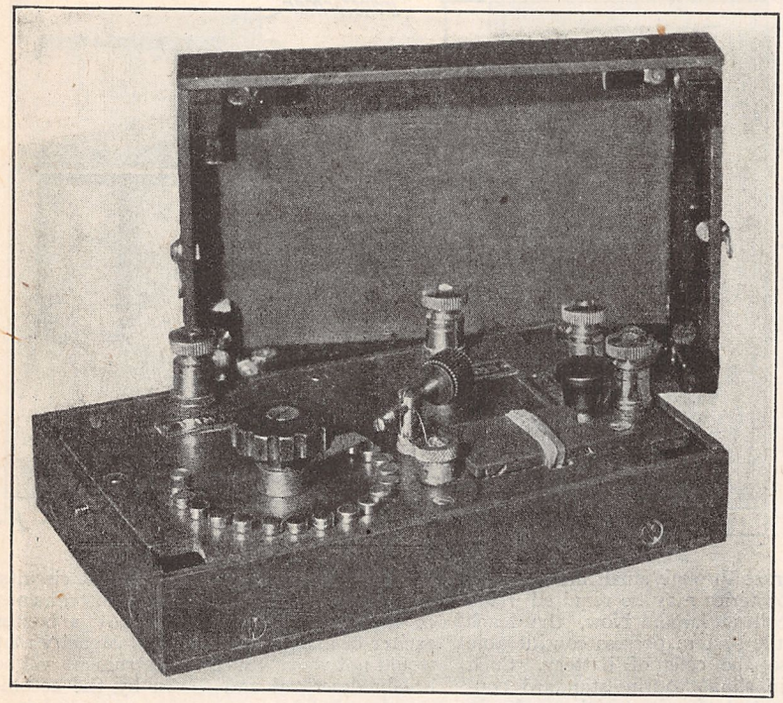
1 lb. No. 29 gauge Silicon transformer steel,
3 oz. No. 40 enameled copper wire,
75 ft. No. 30 enameled copper wire,
4 in. No. 10 varnished cambric tubing, or "spaghetti,"
20 ft. thin oiled paper, 1 inch wide,
8 mica or fibre washers,
4 binding posts,
2 brass machine screws, oval heads, 8–32 with nuts and washers,
2 strips brass or aluminum 2 x 8 inch, 3–32 inch thick.

The first step in building the modulation transformer is the construction of the core; this is of the "shell" type, lap joints, with an air gap in the magnetic circuit. When completed, the core measures 3 inches long, 2 inches wide, and ½ inch thick, external dimensions. The cross-sectional area of the magnetic circuit is .25 square inches.

The laminations for the core are cut to the dimensions given in Detail A, Fig. 2. Of the

(*Continued on page* 1210)

Awards of the $375 Pocket Radiophone Contest



This Compact and Well Designed Crystal Receiver Was Entered in the Contest by Mr. Silver. The Box Is Made of Bakelite.

First Honorable Mention
Mr. JOHN POWELL, Jr.
1018-37th Avenue, Seattle, Washington

Second Honorable Mention
Mr. DONALD SILVER
1319 California St., Columbus, Indiana

Third Honorable Mention
Mr. H. P. TRAMBLEY
2437 Polk Street, San Francisco, Cal.

First Honorable Mention

The complete portable set entered by John H. Powell of Seattle, Washington, deserves special commendation. The complete outfit is made up of two small mahogany boxes, neatly made and finished, 2″x3⅞″x6¾″. One box contains the tuning units, and the controls for the Aeriotron detector tube, with which the set is equipped. A single circuit tickler feed back circuit is used, and the coils are flat-pancake wound, so as to get a maximum of inductance in the minimum space. A special seven-plate condenser is placed in the antenna lead, to facilitate tuning. Seven taps are taken out on the primary winding. A knob controls the tickler feed back coil. A very clever miniature rheostat serves to control the current from a small battery, which may be seen in the other case.

A specially made base accommodates an aeriotron tube, which, when the set is not in use, fits into the other box, together with the antenna wire and spool, and the filament battery. Every joint is carefully soldered, and the assembly is very rugged, and well-done.

All of the essentials for the tuning are mounted on a bakelite panel. Small knobs are fitted to pointers indicating the rheostat, tickler, and condenser positions. The special "B" battery is placed at the bottom of the box, and connections to it are made with two flexible leads. The tiny contact points and spot pins go well with the diminutive knobs.

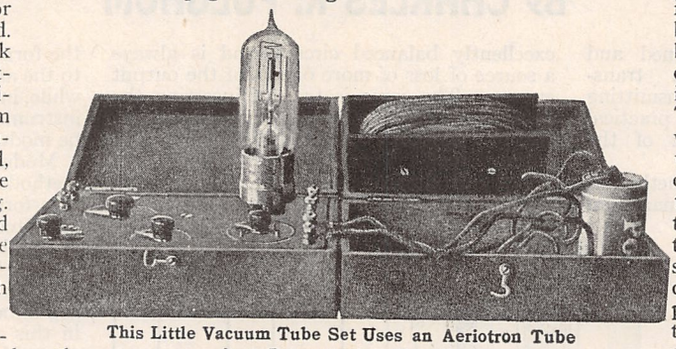
The antenna is wound on a special form, which fits in the second box, when not in use. It is made of flat stranded copper rubbon, and has, therefore, little or no resistance.

Second Honorable Mention

This crystal receiving set was built in a bakelite box, using ⅛″ bakelite, the outside dimensions being 2″x4″x6″when the cover is on.

Although it employs the standard crystal detector, it has been found by the builder to equal dozens of newer ideas in being the simplest and most compact. It is the result of a month's work, being built especially for this contest.

The insulation qualities found in this outfit are its best features. It is almost entirely made of bakelite, copper and brass, and all wires used for connections are covered with spaghetti tubing.



This Little Vacuum Tube Set Uses an Aeriotron Tube in a Regenerative Circuit.

The tuning coil (see Fig. 1) is composed of two pieces of ⅛″ bakelite separated by two ⅜″ pieces of wood. It is 5″ long, 1¼″ wide, and ⅝″ high. It is wound with No. 26 D. C. C. wire having 212 turns. Taps are taken off at every 12 turns. The size of the tuning coil gives it a longer wave-length, a feature very seldom found in pocket receivers.

The variable condenser was built according to Mr. Corvey's article which appeared in the July issue of RADIO NEWS. It is composed of two small copper plates separated by a piece of mica. The fixed copper plate is 9″x13″. It is bent over .1″ at each end, far enough to make it catch in saw cuts, which are in the piece of bakelite.

The mica is glued to the fixed plate. The movable plate is 9″x15″ and has .1″ bent over at one end only. The movable plate is held in place by a rubber band around the piece of bakelite and is raised or lowered by turning the knob on the machine screw which is threaded into the bakelite base.

The crystal detector is a Rasco "Baby," removed from its base and remounted on the panel of this outfit.

The cabinet is in two sections. One half is used as the cover and the remaining half is used as the instrument container. The sides are held together by ⅜″ strips which are bolted to the pieces of bakelite. On the cover at each corner is a projecting peg which fits into the panel and assists in holding the cover rigid while in the pocket.

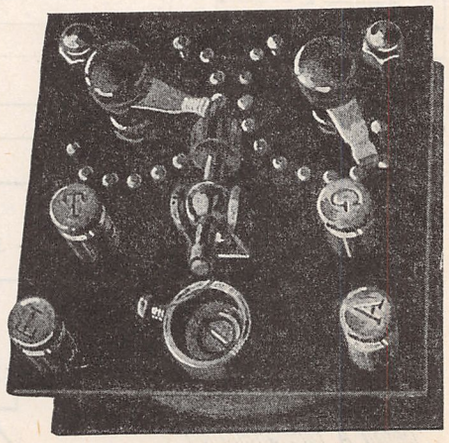
Another container is made of quarter sawed oak and is used to carry the aerial and insulators. In this container there is room for the aerial wire and four insulators, which are made of strip bakelite with holes drilled through each end.

On trying this set, wonderful results were obtained. Spark stations were picked up galore, and WOH, a broadcasting station which is 40 miles distant, came in fine about noon.

Third Honorable Mention

For compactness, the set made by Herbert P. Trambley, of San Francisco is interesting. It consists essentially of two bakelite plates, 3″ square, supported by four pillars 1″ high, and ¼″ in diameter. Between these two plates is mounted the tuning inductance. This is made of a multi-layer coil wound with cotton covered wire, and with taps brought out to a series of taps, one to two sections on the top panel. Thus, a double slide tuner effect is the result. Tiny contact points are provided, over which small switch arms slide. A crystal detector, and two sets of binding posts, one for the ground and aerial, the other for the telephone receiver, complete the layout for the top panel.

The workmanship on this set is very good, and good results were obtained with it.



Mr. Trambley's Set Is Very Compact and Works Exceedingly Well.

Radio Digest

JAPANESE RADIO AND CABLE OPERATIONS

Japan proposes to come to an agreement with the Chinese Government as to the disposition of the radio stations at Tsingtau and Tsinan and to arrange for the continued operation of the submarine cables between Tsingtau and Sasebo, which were part of the communication system developed and administered by the Germans but taken over by the Japanese during the war.

The proposed changes in operation of cable and radio will be in accordance with the provision of the recent treaty, which covered the restoration of Chinese communications to the Chinese Government in a large measure. That government is disposed to co-operate with private foreign capital in the development of the cable and radio systems in China, but the sense of the treaty provision is to prohibit the handling of commercial telegraph business by any means from China through the agencies of foreign governments. The American radio stations at Peking and Shanghai will eventually be closed to commercial traffic, although permitted to handle American and Chinese Government messages. Plans are under way for the establishment of a high-power commercial radio station by an American company.

COLLEGE INSTALLS BROADCASTING STATION

One of the latest additions to the college radio stations of the East is that of the Connecticut Agricultural College, Storrs, Conn., where a broadcasting station 640′ above sea level is being installed. Two towers, 104′ high with an "L" aerial 250′ long, have been erected in the rear of the mechanical engineering building at Storrs. It would seem that the height of this aerial above sea level, 744′, would give excellent conditions for radio sending.

Whether the Storrs station will be a link in the New England chain of market report stations is not yet known, but college authorities expect to disseminate current agricultural knowledge, grange programs, weather reports and results of athletic contests from the college towns. This is probably one of the largest broadcasting stations in Connecticut and will include in its scope, Connecticut, Rhode Island and Massachusetts. Marshall Dawson, chaplain of the Connecticut Agricultural College is perhaps one of the first college preachers to realize the value of the radio to a religious and intellectual center. Mr. Dawson is trying to arrange with college authorities to have one of his services during the college year, broadcasted over the state.

U. S. NAVY NIGHT A REGULAR FEATURE OF WJZ'S PROGRAM

Arrangements have been made by the Navy Department and the Westinghouse Co. whereby the Broadcasting Station "WJZ" at Newark, N. J., will set aside one night a month to be known as "Navy Night." On this night the Navy will be represented by distinguished and well-known officers of the Navy, such as Assistant Secretary of the Navy Theodore Roosevelt, Admiral W. S. Sims, and Admiral Gleaves, who commanded the transport service during the war. It is also hoped Admiral Vogelgesang, who is known in Brazil as aid to Secretary of State Charles E. Hughes, and Admiral Jones, Commander-in-Chief of the Atlantic Fleet, will be able to speak.

On "Navy Night" a concert will be furnished by the Navy Yard Band or the band of some ship that may be in port.

The idea of having prominent naval officers speak directly to the people, by means of radio, is to give them a better idea of the large amount of work the Navy is called upon to do in time of peace, as well as to establish a closer relationship between the Navy and the inland centers of population. A great many families throughout the Middle West have sons in the Navy, and first-hand information about this service from the men who direct the Navy's activities will be appreciated by them.

This will open an entirely new field in radio broadcasting and place the people in a position to get more direct knowledge of their Navy.

ELEVEN CLASS "B" STATIONS WILL BROADCAST ON 400 METERS

During the week ended September 30th, the Department of Commerce licensed eleven broadcasting stations in the new Class "B." This is the first issuance of the new licenses to the super-broadcasters and celebrates the licensing of the first broadcasters a year ago. All of the stations licensed under the new regulations are old ones which have been listed under Limited Commercial stations engaged in broadcasting for some time. They comprise large stations which have qualified with the rigid requirements of the Department, and are now entitled to use the special 400 meter wave-length assigned exclusively to these stations. Only high-class entertainment will be carried; mechanical music is forbidden. The stations which remain in Class "A," over 500, are permitted to broadcast "canned" music if they desire.

NEW CLASS "B" STATIONS

Among the B Stations are the well-known calls of Westinghouse, General Electric, Western Electric, the A. T. & T. Co., and such papers as the Detroit *News*, St. Louis *Post-Dispatch* and Dallas *News*.

The first Class "B" list follows:

LIMITED COMMERCIAL CLASS "B" STATION LICENSES ISSUED TO OPERATE ON WAVE-LENGTHS OF 400 METERS, WEEK ENDING SEPTEMBER 30

WFAA—A. H. Belo & Co., Dallas *News*, Dallas, Texas.

WBAY—American Telephone & Telegraph Co., New York, N. Y.

WOR—Bamberger, L., & Co., Newark, N. J.

WWJ—Evening News Assn., Detroit *News*, Detroit, Mich.

WGY—General Electric Co., Schenectady, N. Y.

KSD—Pulitzer Publishing Co., St. Louis, Mo.

WHAZ—Rensselaer Polytechnic Institute, Troy, N. Y.

WOO—John Wanamaker, Philadelphia, Pa.

WEAF—Western Electric Co., New York, N. Y.

KYW—Westinghouse Electric & Mfg. Co., Chicago, Ill.

WCX—Detroit *Free Press*, Detroit, Mich.

Some Interesting Articles Appearing in Practical Electrics for December

Farm Hydro-Electric Plant

X-ray Treatment of Cancer

Telelarm System

Indicating Voltmeters and Ammeters

Operating Railroads by Static Electricity

New York Fire Alarm Telegraph System

Automatic Welding Machine

Testing an Experimental Switchboard

Longer Life for Electrical Devices

FIRST BROADCASTER IN ALASKA IS WLAY

Thirteen regular broadcasting licenses, now known as Class "A," were issued by the Department of Commerce during the week ending September 30, among them the first broadcasting station in Alaska, WLAY, the station of the Northern Commercial Company, located at Fairbanks, nearly in the center of that territory, will broadcast a program of entertainment for the benefit of the citizens within a radius of about 500 miles.

BRITISH RADIO FANS MUST PAY FOR BROADCASTING

It may appear surprising to Americans that radio broadcasting on a large scale has not yet been begun in Great Britain. The reason is that British Government authorities and the radio manufacturers have been making haste slowly in order to avoid what the London *Times* calls "the endless confusion which has occurred in the United States, where broadcasting has been allowed to grow haphazard." Broadly, the British scheme is to have all broadcasting done by a single organization which will be sanctioned by the Government, operated by the manufacturers of receiving sets, and financed jointly by both.

"The six principal manufacturers of radio equipment in Great Britain have incorporated a Broadcasting Company, stock ownership in which will be available to themselves and to any other manufacturers of radio receiving equipment in the British Isles," said Mr. Frank Gill, of London, European Chief Engineer of the International Western Electric Company and President-Elect of the British Institution of Electrical Engineers, who has just arrived in the United States. "The Broadcasting Company will have a capital of £100,000, which has been guaranteed by these six manufacturers.

"Any bona-fide British manufacturer of wireless apparatus may join the company by subscribing to one or more shares. The president of the Broadcasting Company will be Lord Gainford, a well known public man who is not connected with any of the radio companies. Present plans call for the establishment of six stations at London, Birmingham, Manchester, Newcastle, Cardiff, Glasgow, Plymouth and Aberdeen.

"The question which is beginning to draw more and more attention in America as to who shall pay the very considerable expenses of operating broadcasting stations and furnishing satisfactory programs, has been solved in Great Britain in an ingenious way," said Mr. Gill. Over there, amateur receiving sets have always required a license from the Post Office Department, which has supervision over all forms of communication. This license fee is 10 shillings per annum, or about $2.20. The Post Office has agreed to pay to the Broadcasting Company half of this annual fee. The Postmaster General believes it is to the real interest of the country that the Government should assist in providing first-class broadcasting service.

While it is, of course, possible for an amateur to erect a receiving set surreptitiously, it is Mr. Gill's opinion that only a very small number have, or will take this method of avoiding the payment of the license fee. "I notice that you motorists on Fifth Avenue, New York, invariably halt

(*Continued on page* 1128)

Inductance and Capacity

Interesting Mechanical Analogies

IN simple electrical circuits we speak of the quantity and pressure of the electricity, and also of the resistance of the circuit, and there is no difficulty about grasping the exact meaning of the terms used. In wireless circuits we introduce two other quantities—namely, inductance and capacity

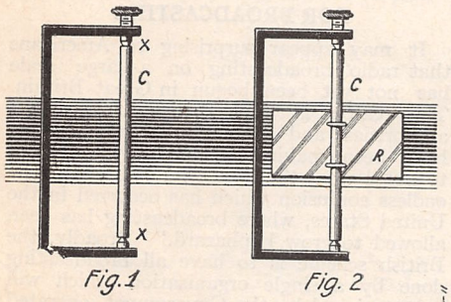


Fig. 1 Fig. 2

Mechanical Analogy of Two Phenomena — Inductance and Capacity.

—and the amateur has some difficulty in picturing in his mind the exact meaning of these terms. However, by means of a simple piece of apparatus, which can be rigged up in a few minutes, an almost perfect mechanical analogy can be obtained.

EXPERIMENTAL APPARATUS

The apparatus consists of a simple iron stand fitted with two steel centers, one of them being a screw center in order to allow of the interchange of various steel rods which are mounted between the two centers.

We start first with a plain steel rod C (Fig. 1) and adjust the centers so that the rod is quite free to turn. Now, in all cases, we assume that the mass of steel in the rod represents the current (or number of amperes) with which we are working. The rod may be twisted by means of the fingers applied to the upper end of the rod, and we will assume that in all cases the twisting force of the fingers is the E.M.F., or voltage, which tends to revolve the rod or current.

DIRECT CURRENT

In our first case the centers offer very little friction, and we may say that the contrivance represents a circuit containing only current without resistance, inductance, or capacity. If we apply a little E.M.F. by twisting with the fingers continuously in one direction we have an analogy for a direct current without resistance, induction, or capacity. We shall find that the rod may be started rotating and kept rotating with very little effort. Under such conditions an electric current may be started at once and kept up with very little energy. If there were absolutely no resistance at X and no air friction the rod would keep up its rotation forever after it had been once started. In the same way, if we could get an electric circuit of no resistance the current would flow forever when once started. If we pinch the rod between the fingers we are introducing enormous friction and the rod stops; in the same way a current is stopped by the sudden introduction of enormous resistance by breaking the circuit.

RESISTANCE

Now replace the plain rod by one fitted with a light metal vane R (see Fig 2). This vane will offer continuous air resistance during rotation. We may compare this vane with the resistance of an electrical circuit. The rod can be rotated as before, but a little more twisting force will be required, or, rather, the same force will not rotate the rod as fast as before; in other words, the current is less when the resistance is greater and the E.M.F. is constant.

INDUCTANCE

For our third case we take a rod fitted with a heavy lead disc K (Fig. 3). Now this disc does not cause much air resistance, owing to its solid shape, but it possesses considerable "inertia"—that is, it requires considerable force to set it in motion or to stop it when it is already in motion. This property of inertia is possessed by all bodies and depends on their weight and shape. It is well known that a machine or a flywheel requires considerable force to start it moving, yet when once going it is easy to keep in motion. This mechanical inertia represents inductance or electric inertia in an electrical circuit, the effect of which is to oppose momentarily the starting or stopping of a current. In our apparatus we have an analogy for a circuit with inductance only. On rotating we find it somewhat difficult to start, but when we get up speed, the rod, etc., will revolve with very little energy being applied to it. Now introduce great friction or resistance by suddenly grasping the rod with the hands; it will be found impossible to stop the rotation instantly; the rod will still revolve a little before coming to rest. This is comparable with the continuance of the current in a circuit containing inductance; the current flows on and will set up a momentary spark across the air gap at the switch.

Now let us apply a resistance vane R and the inductance disc K (Fig. 4). This combination will require a greater effort to set in rotation but a smaller one to stop it. This is because the action of the vane is always such as to prevent rotation. In our electric circuit possessing resistance and inductance the tendency of the current to keep on after breaking the circuit is less, the greater the resistance.

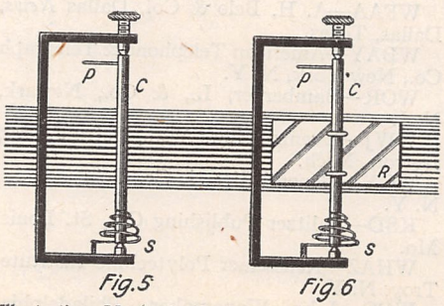


Fig. 5 Fig. 6

Illustrating Mechanically the Operating Principle of the Condenser.

CAPACITY

Now let us introduce "capacity." Take another steel rod as before, but in this case attach a helical steel spring S to the rod (Fig. 5). This spring is somewhat similar to the hair spring of a watch; the center is attached to the rod, while the end is attached to the framework of the stand. A pointer *p* will be helpful in indicating the motion of the rod. If we apply twisting force (E.M.F.) to the top of the rod there will be rotation of the rod (current) until the untwisting force of the spring is equal to the twisting force applied to the rod. The amount of twist (charge) that can be given to the rod depends on the flexibility of the spring (capacity) and on the twisting force (charging E.M.F.) applied. When the rod has been twisted as much as possible clamp the rod (insulate it) to prevent it from moving. The apparatus now represents a charged condenser. Release the clamp and the rod will fly around, this indicating the discharge of the condenser. Now, although the apparatus was charged by a steady direct pressure, when the condenser discharges it flies round a little past its normal point of rest, then returns, and returns too much, and thus makes a number of oscillations before coming to rest. This is exactly equivalent to the discharge of an actual condenser.

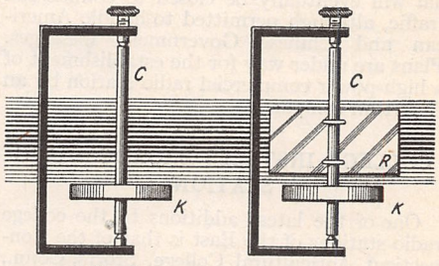


Fig. 3 Fig. 4

This Mechanical Device Represents Inductance or Electric Inertia in an Electrical Circuit.

It should be noticed that with capacity the rod tends to return to its original position, whereas with inductance it tended to go on. In other words, induction and capacity are directly opposed to each other.

Now let us fit up the apparatus with resistance and capacity, as in Fig. 6. On twisting the rod (E.M.F.) it will require greater force to twist C at the same speed as before. When the rod is released it will take longer to return to its original position owing to the resistance offered by the air. This is equivalent to charging or discharging a condenser through a resistance. Now consider the case where we have inductance and capacity, as in Fig. 7. Apply the twisting force as before. Both the inductance and the capacity tend to resist the rotation. If after rotating the rod a little the twisting force be removed it will be noticed that the inductance tends to rotate the rod still farther, whereas the

(*Continued on page* 1201)

Awards of the $50 Radio Wrinkle Contest

PRIZE WINNERS

FIRST PRIZE, $25

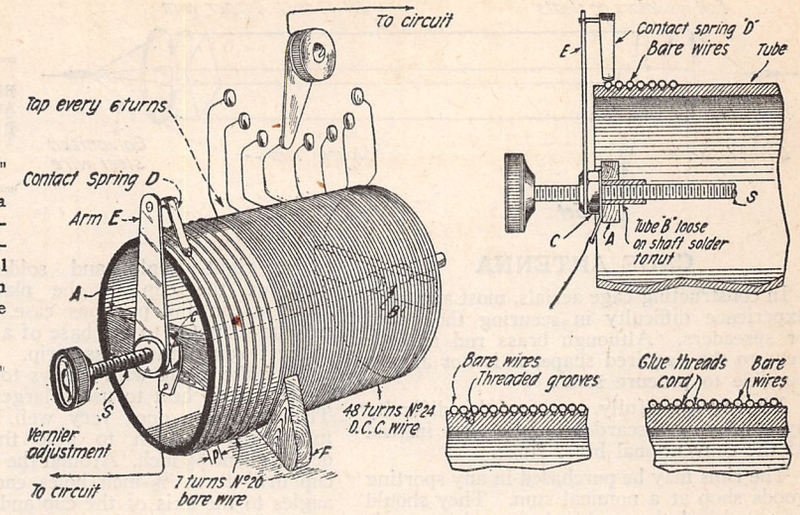
Victor Lougheed
Detroit, Mich.

SECOND PRIZE, $15

E. J. Pilkington
Cambridge, Mass.

THIRD PRIZE, $10

J. B. Rathbun
Chicago, Ill.



By means of a vernier adjustment exceedingly small variations in tuning can be effected.

First Prize

A DEPARTURE IN TUNING COIL SLIDERS

By VICTOR LOUGHEED

The following is a description of a novel movable contact for tuning coils.

This wire helix takes the place of the ordinary coil slider, over which it has several outstanding merits.

First—it is exceedingly cheap and simple as compared with the assemblage of rods, standards, springs, contacts, etc., involved in ordinary slider construction.

Second—it produces its shifting of the contact point by a rubbing contact parallel with the turns of the wire, instead of across them, so that it avoids the common tendency to drop in between two adjacent turns; it is possessed of a smooth movement instead of a chattering movement, and does not wear off copper particles which short the adjacent turns.

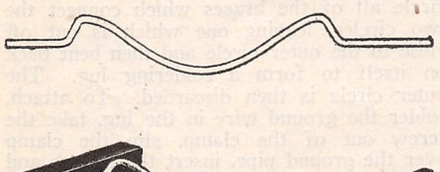
Third—the fact that it works by rotation permits operation by a neat rotating knob on one end, of any desired type.

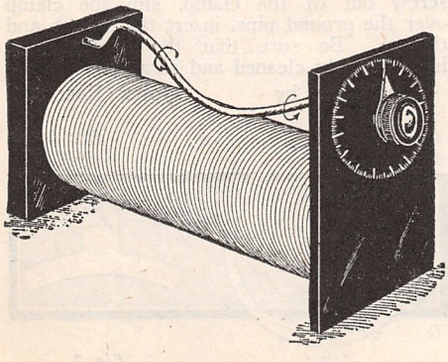
Fourth—it is cheapness itself, and can be made by any amateur, by bending a wire around a rod of suitable diameter, afterwards producing the straight ends with a pair of pliers. One end can then be bent at right angles and made into a pointer, to be turned by the fingers, with or without a dial, so that even a knob is not necessary.

The contact is a straight-line traverse, parallel to the axis of the cylinder, along which line the insulation of the wire must be removed in the usual manner.

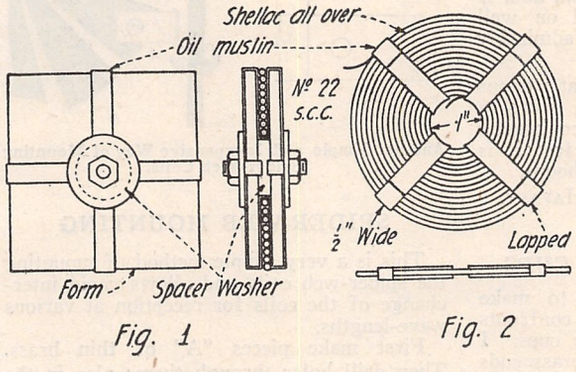
Mount through holes in the coil end plates so that the helix is somewhat sprung against the coil, making good contact. The straight ends should be of appreciable length, in relation to the helical portion, to facilitate this springing. The helix should be about 300°—5/6 of one turn. One-eighth inch diameter brass wire is about right for 4-inch length of the wound portion of a coil. For longer coils, heavier wire is better.

This is a genuine new idea in "Radio Wrinkles" and will save many amateurs a lot of money. It works perfectly, as must be obvious to any one and as is proved by the fact that I have made many dozens of them, and used them successfully.





This Novel Wire Arrangement Takes the Place of the Conventional Rod and Slider.



How the Efficient Pancake Coil Is Made and Assembled.

In the case of the writer 30 turns were wound in pancake (helix) form of No. 22 S. C. C. wire.

Half-inch strips of oil muslin were arranged as shown in Fig. 2, and as wire is wound, sticks to muslin which had previously been coated with heavy shellac. When allowed to dry and removed from form the coil was coated with shellac and again allowed to dry, presenting a rigid article.

Two such coils were used, one as a primary in the antenna circuit with a variable condenser in series and the other (secondary) in the grid circuit.

The two coils when laid flat upon the table one on the other may be made to produce any degree of coupling by sliding horizontally.

Later a third coil of similar construction, but of fewer turns, was connected in the plate circuit for regeneration.

With 50 feet of lamp cord laid on hallway floor as an antenna in conjunction with a detector tube and one stage of amplification, excellent results were obtained.

Such coils may also be used as primary and secondary of radio-frequency transformers which work very well. The ratio of turns may be made 2 to 1 and the proper number of turns wound so as to cover any desired band of wavelength.

Second Prize

REAL PANCAKE COILS

By E. J. PILKINGTON

I recently constructed what I believed to be an efficient set of novel pancake inductance coils.

The coils may be arranged on plugs similar to those used on spider web coils and described in a recent issue of RADIO NEWS. Or, they may be connected with flexible leads as I have them connected.

The construction is quite simple and the results are generally good.

Two perfectly flat surfaces of wood or sheet metal for a form as shown in Fig. 1 are bound together with a bolt having two outside washers for holding free ends of oil muslin, and a spacing washer the thickness of wire to be used.

Third Prize

SUBSTITUTE VARIOMETER

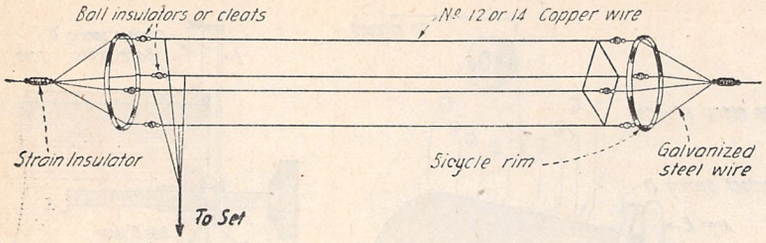
By J. B. RATHBUN

The variable inductance shown herewith is both simple and cheap to make and is an accurate and desirable substitute for the more expensive and difficult variometer. Really it is a sort of vernier inductance in which exceedingly small alterations are made by moving a slider contact along the length of a bare wire just as with certain classes of vernier rheostats. However, it provides a means of unequaled accuracy in closely adjusting to wave-length in tuning, or in controlling the oscillations of a tube in a regenerative circuit. So close is the control that no condenser is necessary in tuning the aerial circuit, and this saving alone is a great item in the saving of cost.

As will be seen from the general assembly,

(*Continued on page* 1126)

Practical Hints for Amateur Constructors



Bicycle Rims Are Used for Spreaders in This Cage Aerial.

CAGE ANTENNA

In constructing cage aerials, most amateurs experience difficulty in securing the hoops or spreaders. Although brass rod may be bent to the required shape, it is not always possible to procure same.

I have successfully overcome this difficulty by employing discarded bicycle rims instead of the conventional brass rings.

The rims may be purchased in any sporting goods shop at a nominal sum. They should be varnished thoroughly before the cage is raised into position.

The details are clearly shown in the accompanying cut.

The insulators at the terminals of each wire are not essential. They may be used but I would not advise it. The only insulators necessary are those marked "strain." These insulators should be as perfect as possible.

Either stranded or No. 14 copper or copper-clad wire may be used.

The leads are taken off at a point convenient to the operating room and should be soldered at all joints. The lead in may be a cage of smaller diameter, if desirable.

The cage type of aerial is rapidly finding favor among amateurs and is slowly replacing the simple single wire. It is efficient for either reception or transmission, and, if carefully constructed and erected on well designed masts, will stand up admirably under all weather conditions.

The hoops may also be placed at various points between the outer or main hoops in order to obtain a neat looking equipment. For stretches over one hundred feet it is advisable to employ four or more hoops.

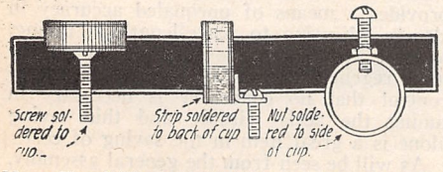
Contributed by A. HAVASY.

SOURCE OF DETECTOR CUPS

The amateur who undertakes to make his own mineral detectors soon confronts the problem of obtaining detector cups. I have had good success using the brass ends of cartridge fuses. The small or thirty ampere size does very well for crystals mounted in soft metal.

Cut about 3/16 inch from the open end. This leaves a cup about ¼ inch deep. Solder to the bottom of this, as shown in sketch, a flat-headed brass screw long enough to make connection under the base of the detector. Countersinking slightly the hole in the base will permit the cup to come down properly.

To mount the cup horizontally on a base or up on a panel cut a strip of brass about 1/16 inch thick, ¾ inch long and ⅜ inch wide. Round off each end to improve the appearance. Drill a ⅛ inch hole at one end. Bend the strip in the center to a right angle and solder to the back of the cup in the place of the screw as in the previous case. This cup may be mounted to the base of a panel by a screw through the brass strip.



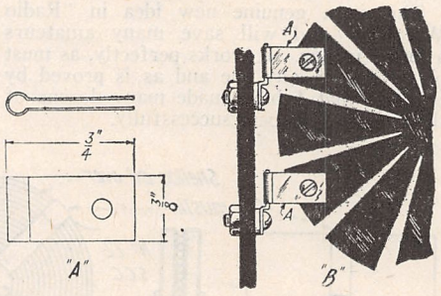
Many Novel Ways of Making and Mounting Detector Cups Suggest Themselves to the Handy Experimenter.

To make a cup with screws to mount the mineral, it is best to use a larger fuse end. The next size does very well. This cup may be cut down to give the required depth, about ⅜ inch. Around the wall of the cup drill three ⅛-inch holes each at right angles to the axis of the cup and at 120° to each other. These may be tapped and screws inserted to hold the crystal, or brass nuts may be soldered over each hole for the screws. Such a cup may be arranged for mounting as previously described.

If the experimenter is properly equipped and so desires he can nickel plate these cups thus greatly improving the appearance.

A few old fuses for this purpose can usually be obtained from any user of electric power.

Contributed by KENNETH E. MILES.



Another Simple and Inexpensive Way of Mounting Spider-Web Coils.

SPIDER-WEB MOUNTING

This is a very simple method of mounting the spider-web coils and allows rapid interchange of the coils for reception at various wave-lengths.

First make pieces "A" of thin brass. Then drill holes through them; also in the coil forms. Fasten these pieces to the forms with short machine screws. The parts to be secured to the panel are quite simple.

Put machine screws through the panel and solder to the heads of the screws short pieces of No. 12 copper wire, extending up for about ½ inch. The general arrangement of the parts is shown at "B." The ends of the coils may be soldered to the brass pieces. The connections to the coils may be taken from the back of the panel.

Contributed by JOSEPH BRUBACKER.

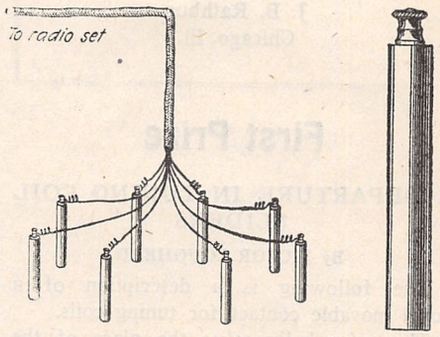
AN EFFICIENT GROUND CONNECTION

The ground connection here described has the double advantage of efficiency and cheapness. The woven or twisted copper lightning rod of today is usually made up of about 32 No. 17 wires twisted in groups of four, first. When untwisted we have eight stranded wires. To the end of each attach the carbon from an old dry cell, by soldering, preferably. The eight terminals are then spread out in fan fashion, as shown, and buried in the earth.

If the ground is not strong a good way to place them is as follows:

Untwist the lightning rod for 6 or 7 feet. Then take a ¾-inch pipe and drive it down for a distance of 6 feet. Pull it out and the carbon can then be pushed in. By keeping the holes close together at the top, the ground can go down to the surface of the earth before being spread, thus making a more solid job, less liable to be broken or pulled out of place.

Contributed by J. HORACE SHAW.



Carbon Rods from Dry Cells Make Good Grounds.

A HANDY DIAL INDICATOR

A dial indicator now manufactured by a prominent dealer in radio supplies may easily be duplicated by the amateur, at small cost. You all have left-over switch points, long covered with dust; carefully remove one from Hon. Junk Box and, with care, file a narrow groove half-way across. Use a small file, and be sure that the end of the groove is at the center of the contact.

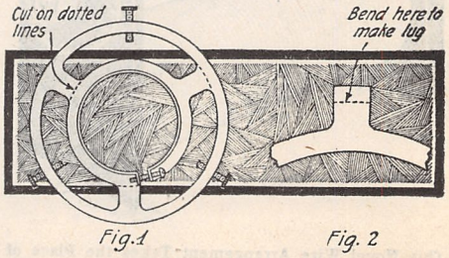
The indicator may be placed close to the dial and directly over it. The groove is lined up so that it will form a continuation of the marks on the dial. This type of indicator may be used with either bevel or straight-edge dials.

Contributed by LEON NETTLETON.

A SIMPLE GROUND CLAMP

A ground clamp which serves its purpose very well can be made from an ordinary electric light shade holder as shown in diagram No. 1. Cut off close to the inner circle all of the braces which connect the two circles, leaving one which is cut off close to the outer circle and then bent back on itself to form a soldering lug. The outer circle is then discarded. To attach, solder the ground wire in the lug, take the screw out of the clamp, slip the clamp over the ground pipe, insert the screws and tighten. Be sure that the ground pipe is thoroughly cleaned and scraped.

Contributed by JOHN ROBLEE.

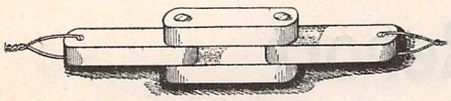


By Altering the Family Light Shade Holder a Good Ground Clamp Results.

A PORCELAIN INSULATOR

I present herewith an interesting wrinkle consisting of four cleat porcelain insulators connected together to form one efficient insulator.

The arrangement, as shown in the cut, is quite simple. Four ordinary porcelain cleats are arranged so that the outer holes on the center two are in line with each other and separated by the two outside or end cleats. Two brass machine screws about two inches long clamp the unit firmly together. Care



An efficient insulator made from four cleats. If glazed porcelain ones are used it is best, as these provide better insulation.

should be taken not to crack the cleats while tightening the bolts. The insulator is used in the regular manner as either antenna or guide wire insulator.

It should be well, though it is not necessary, to boil the cleats in beeswax until all air bubbles are driven out of them. This is necessary only with unglazed cleats. The glazed cleats do not require this extra precaution.

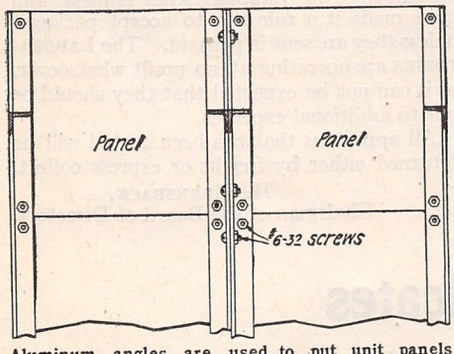
As porcelain cleats may be obtained cheaply at any electric store the cost of these insulators will be quite low.

Contributed by CYRIL V. BELL.

MOUNTING UNIT PANELS

Most amateurs experience some difficulty in mounting unit panels. The usual way to mount them is on a large board with spaces cut out for each panel but this is very troublesome and every time a new panel is to be added a new board must be made. I finally conceived the idea of mounting them on aluminum angles and the result was a neat job and when another panel was added the old ones were left intact. This angle can be purchased for about 10 cents a foot. I used angle ¾-inch wide by ⅛-inch thick. My panels are 4½ inches square and I mounted three in a row, so to mount six I used four pieces of angle each 13½ inches long as is clearly shown in the cut. This idea is much more compact than wood, makes a neater job, takes less time to make, and short leads are another feature. I am sure this is just what you fellow bugs are looking for.

Contributed by SHERLOCK MARTIN.



Aluminum angles are used to put unit panels together by means of small screws and nuts.

SIMPLE TRICK WHEN WINDING COILS

Many amateurs find difficulty in keeping the wire tight after a coil has been wound. Of course paraffin or shellac can be used, but because of the capacity effect or sometimes the homemade appearance, nothing is done to keep the wire in place. As every one knows, copper wire increases in length with an increase in temperature and it is this property that does the trick. Before winding the coil, place the wire near the stove until it has become quite warm. Then wind your coil, heating the wire again if it cools during the process. Be sure to fasten the ends securely to prevent them from pulling out. After the coil has cooled to room temperature, it will be found that the winding has become tight and smooth. A hundred feet of wire heated to about 100 degrees Fahrenheit will contract almost ½ inch when cooled.

Contributed by FRANK SCHUBERT.

$50 in Prizes

The special prize contest for radio amateurs and beginners is held each month. There are three monthly prizes as follows:

First Prize	**$25.00 in gold**
Second Prize	**$15.00 in gold**
Third Prize	**$10.00 in gold**
Total	**$50.00 in gold**

What we desire are simple ideas exclusively for the beginner and the novice, the simpler the radio idea the better the chance to win the prize.

There are lots of valuable little stunts that you amateurs run across every month, and we mean to publish these for the benefit of the entire Radio fraternity.

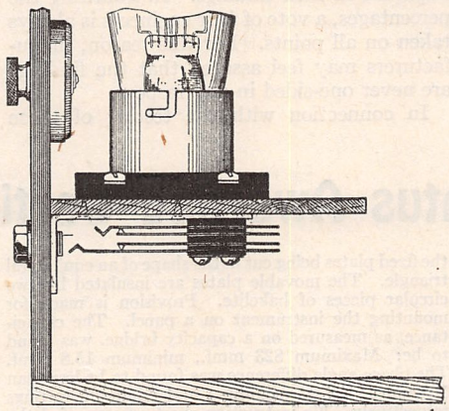
If possible, a clear photograph should be sent with the idea, but if that is not possible, a good sketch will do.

This prize contest is open to everyone. All prizes will be paid upon publication. If two contestants submit the same idea, both will receive the same prize. Address all manuscripts, photos and models to *Editor Radio Wrinkle Contest,* care of this publication.

V. T. SOCKET MOUNTING

As may be seen in the accompanying sketch, the jacks when used in an ordinary amplifier may also be used as brackets upon which the shelf holding the V. T.'s is mounted. The frames are merely inverted and drilled as shown in the sketch; corresponding holes are drilled in the shelf. The jack may either be tapped or a bolt passed through. This not only adds to the compactness of the set, but also simplifies the wiring somewhat. The sketch is practically self-explanatory, but only shows one jack. This process is repeated on the other two, forming a very firm mounting for the V. T. shelf.

Contributed by E. J. HEFELE.

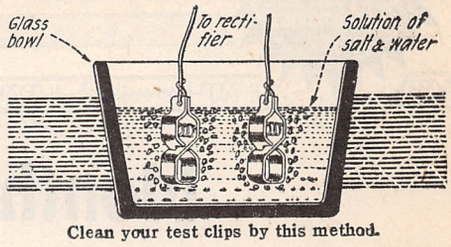


Using the jacks as brackets to support a panel.

AN EASY METHOD OF CLEANING CHARGING CLIPS

Due to the increasing number of low-priced rectifiers being placed on the market, many amateurs are using them to keep their storage batteries in trim. Most all charging outfits are furnished with spring clips to clamp on the battery terminals and after a few months of service these become coated with an objectionable white substance.

The writer found a very quick way to remove this substance from the clips satisfactorily. A bowl of water and a tablespoon of salt is all that is necessary. The salt is



Clean your test clips by this method.

dissolved in the water and the clips to be treated are immersed about ½ inch apart. Then the current is turned on in the same manner as if a battery was being charged and bubbles and a greenish liquid will come from the clips. The action of the current causes electrolysis and the white substance is changed chemically into the greenish liquid. If your clips are iron, as mine were, the greenish liquid will be ferric chloride which changes in a few minutes to ferrous chloride which is brown. Two or three minutes only will be necessary to finish the operation. Then the clips are dried thoroughly with a rag and they are ready for use.

Contributed by HARRY LUBCKE.

A MOUNTING FOR THE "W. P. 11" TUBE

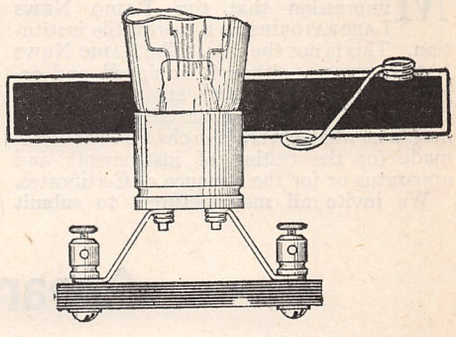
I was unable to purchase a socket for this tube (generally called the "peanut" tube) at any price and doubtless others have encountered the same difficulty.

A piece of bakelite 3 inches square, four binding posts and some spring brass wire are all the things that are necessary. The spiral part of the wire was bent around a six-penny wire finishing nail firmly held in a vise for the three small contacts and the one for the "grid" contact (which is larger on this tube) was bent around a twenty-penny spike.

The inside of the coils was brightened with a rat tail file to insure contact.

This "socket" works perfectly and the natural springiness of the wire takes up any sudden jar.

Contributed by H. C. HARVEY.



With four binding posts and some stiff wire a support may be made for the W. P. tubes as well as for the other types.

VARNISHED TUBING FOR A FEW CENTS

Having need of some varnished tubing, and not being able to obtain any at the time from a local dealer, I tried the following as an experiment. I purchased from a nearby drug store one dozen soda straws. These I placed in a pan of varnish to soak for three hours, after which I was careful to see that the varnish dried in an even manner. They were then cut to the proper length with a pocket knife.

Contributed by H. FRED STROBERG.

Monthly Laboratory Report

By LOUIS GERARD PACENT, Director

WE have received, during the past month, a great number of small parts and instruments, a large proportion of which had to be rejected on account of the construction, either mechanical or electrical. There are now on the market several apparatus which, although they perform what is claimed of them, are not designed and built so that their operation will remain constant and dependable under any conditions. We have noticed, also, that numerous items fail to perform what is claimed by the manufacturers in their catalogs and literature. We consider this misleading for the purchaser and we recommend that the truth be told about anything that is put on the market, as the detrimental effect produced by this process tends to reduce the sales, the customer feeling that the treatment received is unfair when he fails to obtain the results that are promised in the description of the apparatus mentioned above.

Some new concerns which recently entered the radio field have tried to produce something new by changing some details of construction in apparatus which are already on the market; among these we can mention filament rheostats. We had to reject recently some of these instruments for, although novel in design, they were inefficient electrically and not rugged enough to stand constant use. In trying to keep the prices low, some concerns use a cheap quality of material which render the apparatus produced inoperative and entirely too poor. Such practice is objectionable from a commercial standpoint as it hurts the radio business to a greater extent than can be imagined.

Among the apparatus submitted which have been rejected, we noticed that the variocouplers in general were equipped with very poor bearings. The contact to the secondary winding is made, in most cases, by a mere friction of the shaft upon the bearings. This practice is not to be recommended since it is necessary to obtain a good contact to reduce the high frequency resistance, but, on the other hand, if the bearing is made tight enough to insure a good contact, it becomes difficult to rotate it. Very few of the couplers are equipped with stopping pins preventing the secondary from turning more than 90 to 180 degrees, according to the design. There was also submitted for test a number of devices which have been put on the market with a view toward selling something new and which are not really radio apparatus, but accessories in themselves. Upon testing these, we found that very few gave good results and that the majority were not only inefficient, but had not been designed in accordance with modern radio engineering practice. We have also noticed that a great number of apparatus, such as vacuum tube sockets and other devices where a moderate high voltage may be applied, are not insulated properly, fibre and many molded compositions, as well as other material having a low insulation resistance, being used, which are not at all suitable for the purpose.

In order to verify the claims made for each piece of apparatus, we ask the firms sending in instruments for test to enclose with them all literature, catalogs and price lists concerning same so as to enable us to compare the actual results with the claims, and award the percentage in consequence.

To date, we have had 89 apparatus rejected, and 40 awarded certificates. We still have 83 instruments and sets for test.

TECHNICAL DIRECTOR RESIGNS

It is with great regret that we announce the resignation of our Technical Director, Mr. Lewis Mason Clement, on account of the great stress of work and added duties which he has been given by his superiors at the Western Electric Company, which will prevent him from devoting sufficient time to the RADIO NEWS Laboratories. Mr. Clement's basic work in establishing the percentage system and his impartiality will long be remembered by his associates.

Notice

MANY manufacturers are under the impression that the RADIO NEWS LABORATORIES is a mercantile institution. This is not the case. The RADIO NEWS LABORATORIES, although equipped and organized by RADIO NEWS, are run independently and are not connected with that magazine whatsoever. No charge whatever is made for the testing of instruments and apparatus or for the issuance of Certificates.

We invite all manufacturers to submit their product to us for test, and they will be assured that all apparatus and instruments will be tested by Radio engineers of the highest order, who are, moreover, absolutely impartial in their findings. In awarding the percentages, a vote of four engineers is always taken on all points. For this reason, manufacturers may feel assured that the findings are never one-sided in any respect.

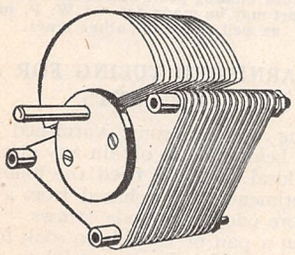
In connection with the testing of these instruments the LABORATORIES request, and have made it a rule not to accept packages unless they are sent in prepaid. The LABORATORIES are operating at no profit whatsoever, so it can not be expected that they should be put to additional expenses.

All apparatus that has been tested will be returned either by freight or express collect.

H. GERNSBACK,
Chairman of the Board of Directors.

Apparatus Awarded Certificates

CAR-JOH VARIABLE CONDENSER

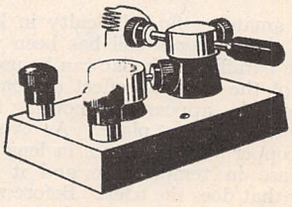


A rugged variable air condenser is manufactured by Carlson & Johnson Machine Co., Wilkes-Barre, Pa. A total of 33 plates, of heavy gauge aluminum are used. The rotating element are of circular shape, the fixed plates being cut in the shape of an equilateral triangle. The movable plates are insulated by two circular pieces of bakelite. Provision is made for mounting the instrument on a panel. The capacitance, as measured on a capacity bridge. was found to be: Maximum 823 mmf., minimum 15.8 mmf. The phase angle difference was found to be less than 10′ and 4° 40′ at maximum and minimum settings respectively. No instruction sheet accompanied the instrument. Arrived in good packing. Received a percentage rating of 76.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT No. 33.

WILLIAMS CRYSTAL DETECTOR

A detector stand capable of universal adjustment is made by J. C. Williams, 389 40th St., Oakland, Calif. A base of hard rubber supports the cup and the catwhisker, both of which are rotatable. The catwhisker lever is capable of motion in three directions, thus affording means for exploring every part of the surface of the sensitive Galena crystal furnished with the stand. Provision is made for locking



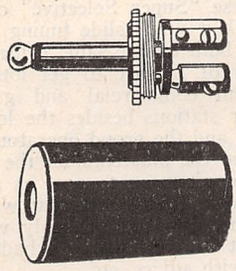
the adjustment once it is found. Received in good packing. Received a percentage rating of 72.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT No. 34.

RSC TORPEDO PLUG

The torpedo plug manufactured by the Radio Stores Corp., 220 W. 34th St., New York City, employs fibre insulation throughout. Two small machine screws hold the cord tips in place. Provision is made for tying the phone cord so that accidental strains will not pull the cord tips loose. The shell is finished in dull black. Arrived in good packing. Received a percentage rating of 69.

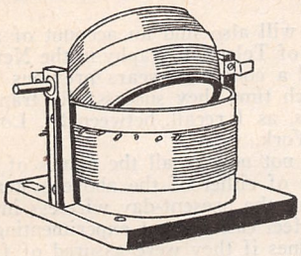
AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 35.



RADISCO VARIOCOUPLER

The Radisco Variocoupler, of good construction, is manufactured by the Radio Distributing Company, 8 West Park Street, Newark, N. J. The primary winding is on a bakelite tube, and the secondary on a rotor of moulded composition. Two upright supports with brass bearings hold the secondary above the primary. Connection to this rotor is made by two copper foil strips. Windings are of double cotton covered wire, coated with a black compound to protect it from moisture. The taps for single and multiple turns are neatly brought out and securely soldered. A sub-base 4⅝ inches square carries the entire instrument. Shaft accommodates a ⅛-inch dial. The wave-length range of the primary on the laboratory antenna was found to be 597 meters, maximum. The secondary with a 0.0005 mfd. variable condenser across the terminals gave a wave-length range of 75 to 482 meters. With a 0.001 mfd. condenser the wave-length was increased to 644 meters. Arrived in excellent packing. Received a percentage rating of 68. No instruction circular accompanied the article.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 28.



PIONEER CW-S VARIOMETER

This variometer, moulded from condensite is manufactured by the Pioneer Radiophone Corp., of Galesburg, Ill. The windings are of double silk-covered wire, neatly wound on both stator and rotor. A stopping device prevents continuous rotation of the ball. If necessary, the shell can be taken apart by removing the four machine screws at the end bearings. Provision is made both for panel and table mounting. The wave-length range, with a 32-turn variocoupler secondary in series, was found to be 130 to 450 meters. The inductance was 97.6 to 1596 microhenrys. Arrived in good packing. No instruction sheet accompanied the instrument. Received a percentage rating of 75.

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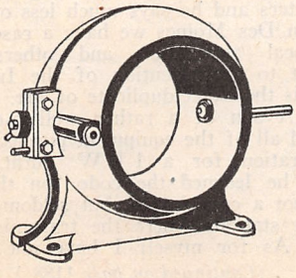

HOLD-TITE PLUG

The Hold-Tite Plug, manufactured by Martin Copeland Company, 101 Sabine St., Providence, R. I., is of the conventional torpedo design. The insulation of the plug and shell are of fibre. Two small thumbscrews are used to hold the cord tips in place. The plug measures ⅞ inch diameter by 3¼ inches long. The finish is of brass. Arrived in good packing. Received a percentage rating of 67.

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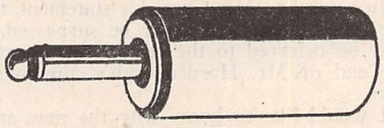
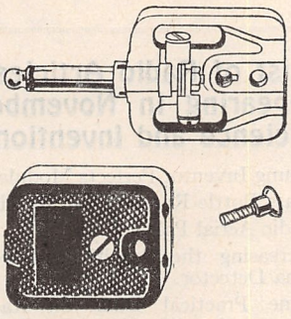


UNIVERSAL RADIO PLUG

The Universal Radio Plug is made by the Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. It is of conventional design and is adapted to hold either flat lugs or the regular cord tips. The case is of polished moulded composition, made in two halves, held together by means of a machine screw passing through the body of the shell. Micarta is used for insulating the tip conductor of the plug. To relieve possible strains on the cord tips a hole is provided in the shell through which the telephone cord may be passed and tied. Approximate size 2⅞ inches by 1 5/16 x ⅝ inch. Arrived in good packing. Received a percentage rating of 64.

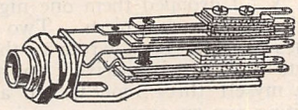
AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 31.



STROMBERG-CARLSON JACK

A highly finished article is the jack manufactured by Stromberg-Carlson Telephone Mfg. Co., of Rochester, N. Y. In departing from the usual style of plug receptacle, they have offered their new design with a neat appearing tapering effect. The insulation is of micarta throughout. Springs are of nickel-silver. The jack is finished in polished nickel. Adaptable for panels from ⅛ inch to ¼ inch in thickness. Arrived in good packing with instruction sheet enclosed. Received a percentage rating of 78.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 30.



ACE TRU TUNER

The Precision Equipment Co., of 2437 Gilbert Ave., Cincinnati, Ohio, manufacture an efficient single circuit tuner incorporated with a single vacuum tube detector. Wave-length range, as found in the laboratories, was 175 to 550 meters. The selectivity was fair. The windings are covered with green silk wire wound on micarta tubes. Regeneration is accomplished by a tickler coil rotating inside of the tuning inductance. The instruments are mounted on a bakelite panel, mounted in a neat, oak-finished cabinet. Connections for phones and batteries are brought out in the rear of the instrument. In addition, the phone leads are also brought out in front. Tuning is accomplished by means of a series antenna condenser and taps brought off from the tuning coil. Arrived in good packing with instruction sheet enclosed. The ACE Tuner received a percentage rating of 84.

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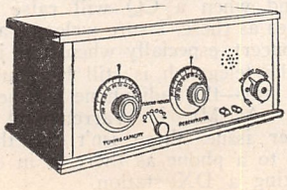
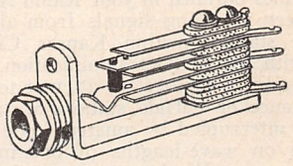


SPIES JACK

Incorporating a very desirable feature in the fanning of the lugs on their jack, the Spies Electric Works of Chicago, Ill., have fulfilled a long-felt want. In the usual jack the lugs are brought out straight with the consequent difficulty in soldering when the jack is connected in the circuit. In the sample submitted, a five-contact jack, micarta insulation was used with nickel-silver springs. The jack is adaptable for panels from ⅛ inch to ¼ inch

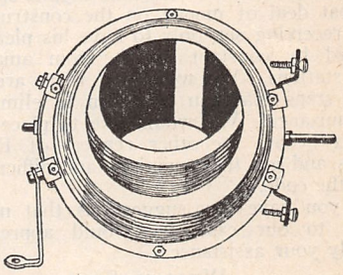


in thickness. The support and front of the jack are finished in nickel. Arrived in ordinary packing. Received a percentage rating of 73.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 27.

L. & K. STANDARD VARIOMETER

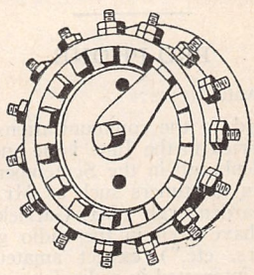
A very neat moulded variometer is manufactured by the Radiall Co., of 99 Warren St., New York City. The shells and rotor are made of hard rubber wound with double silk-covered wire and impregnated with a moisture-proof solution. Two standard windings are employed, one of 140 turns of No. 23 double silk-covered, or 120 turns of No. 22 silk-covered wire. Ample provision is made for panel mounting, insuring a rugged support. The instrument when fully opened occupies a space of 3¾ inches by 3¾ inches by 5½ inches. The brackets are brass finished in nickel. Shaft accommodates a ⅛ inch dial. A self-



wiping electrical joint is provided by the ¾ inch friction bearing. The instrument is of such construction that it may be readily taken apart without impairing the windings or any of the mechanical or electrical features, the two halves of the shell being held together by small machine screws. In the sample submitted, the wave-length range, with a secondary of 32 turns in series, was 175 to 425 meters. The inductance was 222 to 1666 microhenrys. Arrived in excellent packing with no instruction sheets enclosed. Received a percentage rating of 90.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 36.

INDUCTANCE SWITCH



To fulfill a long-felt want, Hinrichs-Knoop Co., Peotone, Ill., offer their multipoint switch. This switch is designed to obviate the necessity of drilling holes in a panel for the mounting of switch points for taps taken off an inductance coil. A bakelite shell with 14 switchpoints set around the circumference is mounted directly on the panel, being fastened by only two screws. A dial suitably graduated controls the switch lever which operates smoothly and noiselessly. Finish of metal parts is of brass. No instruction sheet accompanied the article. Arrived in good packing. Received a percentage rating of 74.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 38.

Correspondence From Readers

ARE YOU SURE THEY ARE AMATEURS?

Editor, RADIO NEWS:

Since the erection of our receiving sets along lines outlined in your RADIO NEWS, we have been receiving signals from all broadcasting stations within Kansas City very well, with and without amplification.

However, whenever we attempt to tune-in on distance or outside stations we are constantly interrupted by amateur code stations sending on wave-lengths of 360 meters to 1,000 meters. We have even received these stations on as high a wave-length as 1,000 meters. Often during a concert from Atlanta, Ga., we would be interrupted, and lose the greater part of the concert until these parties closed down their sets, which is usually about 3 a. m. Also our concerts are interrupted before the hour of 10 p. m. We understand that code stations are not supposed to send messages before that time, but any time during the evening that we attempt to tune-in on a concert we pick up some fellow sending code. These interruptions are not so grievous on city receiving because we can tune this code out, but on distance our sets (which are essentially constructed for sharp tuning) necessarily have to tune sharply, and we are unable to tune the code out.

It is a lamentable fact, that anyone spends a great deal of money on the construction of a receiving set, only to have his pleasure marred by constant racket from amateur code stations. We wonder if there are not some steps that can be taken to eliminate this nuisance. We would like to place this matter before the other readers of RADIO NEWS and get their opinions and difficulties with the code.

If you have any suggestions that might apply to our case, we would appreciate greatly your assistance.

WILLIAM SWALLOW,
GAIL C. BRADLEY,
Kansas City, Mo.

(This is the old question again. Were they really amateurs or commercial stations that you heard? In order to make sure, you should get their code letters and consult the call book. If they are amateurs, tell them their wave-length is a bit too broad; they will surely be glad to know that. If they are commercial stations, the only thing you can do is to improve sharpness of your tuning a little more so as to cut them out Otherwise, there is no remedy.—EDITOR.)

PRO-PHONE

Editor, RADIO NEWS:

In regard to the communications of Mr. Ralph Garrick in the June issue and of Mr. Ray Hardenbergh in the September issue:

How can old-timers such as Mr. Garrick or Mr. Hardenbergh (Mr. Garrick himself says: "I have been in the radio game for eight years, etc.") expect amateurs, who have been interested in radio for a month or two, to equal them in knowledge and skill?

I agree heartily with the editor for his excellent answer to Mr. Hardenbergh's communication.

Mr. Hardenbergh will please inform me how the new amateur shall learn and how he learned except by the asking of questions?

Reading data on the subject is certainly only another way of finding the answer to your question.

Experimenting is but another way of finding the answer to your question.

I can assure you that the person who asked: "How much music can I get from this condenser?" will not make the same mistake again.

The asking of such questions is the surest indication that the new amateurs are trying to learn, although Mr. Hardenbergh informs us that they are not.

In regard to Mr. Garrick's statement, that the code station will never be surpassed, he may be referred to the editor's comment at the end of Mr. Hardenbergh's communication.

I would like to know why the new amateurs cannot also qualify for a radio expert's position, as Mr. Garrick seems to be of the opinion that only the older amateurs are eligible for such positions.

Let's hear from a few more "pro-phones."

CHARLES PENTLER,
Wausau, Wis.

WHY RADIO SALES FALL OFF

Editor, RADIO NEWS:

In your RADIO NEWS of September there was a very interesting article, "Why Radio Sales Fall Off."

List of Radio Articles Appearing in November "Science and Invention"

Young Inventor Perfects Modulator.

Glass Bottle Regenerative Receiver.

Radio Aerial Pole.

Increasing the Sensitiveness of a Galena Detector.

Some Practical Data on Radio-Frequency Amplification. By Robert E. Lacault.

Radio Broadcast. List of Latest Radiophone Broadcasting Stations and Call Letters Up-to-Date.

Radio for the Beginner. No. 9, How to Tell What Is in the Ether. By Armstrong Perry.

This is my case: I bought a pair of phones, made by a well-known firm of Buffalo, N. Y. I dropped them one night and broke the rubber ear piece. Two repair companies of New York wrote to this firm for parts and never received an answer. I wrote myself three months ago and am still waiting for an answer.

If many more radio bugs are treated this way, there will be many radio sets pushed under the bed, as many other relics are put out of the way.

Maybe a few more letters of this kind will open the eyes of manufacturers.

H. J. G., Brooklyn, N. Y.

CODE WILL STAY

Editor, RADIO NEWS:

In the correspondence from readers in RADIO NEWS I have seen a great deal of comment about the "Radiophone vs. the code station" and so I have decided to send in my views on this question.

I think that the radiophone is O.K. in its place; many times there are no amateurs going and when a CQ will raise nobody such times as these, I sure welcome a radiophone concert, especially when it is jazz.

Yes, the telegraph is still here and it is going to stay—the radiophone will never replace it. As Mr. J. Warren said in the September issue, there isn't the thrill in listening to a phone as there is in copying or working a DX station.

After all, though, there is no use in running down the radiophone because an amateur C. W. and a spark, if it has as low decrement as it should (.02 or lower), can work while the radiophones are going; of course it depends on the receiver, if it is one of these "Super Selective" crystal detectors with a single slide tuning coil or an audion set built on the same principle. The owner thereof is sure to get lots of good QRM from commercial and government high power stations besides the lesser amateur QRM and the proud operator will generously give the amateurs all the credit.

Now, I don't mean to pose as a superior being, because I was just that way myself a few years ago and probably would still be if a lot of the amateurs hadn't helped me along with advice, etc.

But as a last word I want to let the world know that radio telegraphy isn't on the wane, but on the contrary, it is getting more popular as most of the broadcast listeners, tiring of the broadcasts and having some ambition, are taking up the code.

HENRY JOHN ENGLISH, 9BYX,
844 W. College Ave., Jacksonville, Ill.

ON RADIO PHOTOGRAPHY

Editor, RADIO NEWS:

In RADIO NEWS for August is a description of the Dieckmann system of Telephotography. I have also noticed of late articles on the same subject in different magazines, and all giving the impression that Telephotography is a recent invention.

If you care to look up this subject, you will find an article by the writer, of a system of Telephotography, practically identical with the Dieckmann system, in the *Scientific American* or the Supplement about 1902 or 1903.

You will also find an account of another system of Telephotography in the New York *Herald* a couple of years previous to this, at which time they successfully transmitted pictures, as I recall, between St. Louis and New York.

I do not now recall the names of the inventors of either of the above systems, but I believe the present-day wireless inventors would feel easier about experimenting along these lines if they were assured of freedom of patent infringement. Even the synchronizing method used by Dieckmann is the same as used in the first system I have called your attention to.

H. C. BUNTING,
1631 Queen Anne Avenue,
Seattle, Wash.

SAME HERE

Editor, RADIO NEWS:

I have just read Mr. Humes' answer to Mr. Morris' letter and wish to say that I think your comment on Mr. Morris' letter too consoling. I have no sympathy for Mr. Humes and his attitude. I beg to differ with him very much as to the possibility of an amateur transmitter being heard on 600 meters and he says much less on 1,500. Here in Des Moines we have a case which the local association and others have brought to the attention of the Inspector which is the exact duplicate of Mr. Morris' case. A son of a rather well-to-do man has had all of the equipment purchased and in operation for a 1-K.W. outfit. Last winter he learned the code "on the air." I am not a code hound, but seldom fail to identify stations where the transmission is good. As for myself I have not used a

(*Continued on page* 1188)

Radio Humor

RADIO RHYMES

By Robert Stewart Sutliffe

PUTTING IT OVER

I went into a radio store and looked at sets and horns galore, a hundred different kinds or more,—to make a start; I told the clerk I nothing knew 'bout what to buy or what to do, to get good entertainment through the radio art. I didn't want to get in deep, just wanted something simple—cheap, an outfit any one could keep,—no work for me; some little thing to please the folks, to sing us songs and tell us jokes, to run with simple turns and pokes,—from troubles free.

"This is the place," the fellow said, "don't be by any one misled, for radio outfits we're ahead, we treat you white; don't throw away your time and cash fooling with some simple trash, get something good and cut a dash, start going right. The simple sets are naught but toys, all right for little girls or boys who only want to get a noise, from near at hand; the thing you need is 'Number Eight,' it's radio in the perfect state, from Montauk Point to Golden Gate, you'll hear the band."

They say there's one born every minute; I fell and found myself deep in it. I went the limit to begin it, with that set; more than a hundred plunks I paid to get reception of high grade, but a mechanician, I'm afraid, I'll have to get.

There is a moral in this telling for those with minds on radio dwelling:—the folks who others are excelling, who win fame, are those who work while they are winning, who take it easy in beginning, but when they strike the old ninth inning, know the game.

© Science and Invention

AN ODE TO JULIUS

(With Apologies to Rudyard Kipling)

A fool there was and he got the desire,
Even as you and I.
He bought some tubing and lots of wire,
Even as you and I.
He wrapped it round and took off taps,
And said the thing may work, perhaps?
Even as you and I.

A panel he got and then switch points,
Even as you and I.
A condenser next and wire for the joints,
Even as you and I.
He set the parts up as per directions,
And cussed at Burnt Fingers when soldering connections,
Even as you and I.

He purchased a tube—it cost him five bucks,
Even as you and I.
'Twas worth thirty cents—if you take 'em by looks,
Even as you and I.
An "A" battery, too, and of course also a "B,"
What the difference was—well, he couldn't see,
Even as you and I.

He read up on Microfads, talked of Megohms,
Even as you and I.
But 'twas finally finished and he put on the 'phones,
Even as you and I.
He listened for days and nary a sound,
Till some poor fish told him he needed a Ground!
This between you and I.

Static Eliminator! Comes in tablet form. Guaranteed to do the work. Simply drop a tablet in storage battery before you begin. Agents wanted everywhere.

Too Much Radio

We received from Mr. Raymond Hintgen this letter showing how radio can affect some people.

We do not doubt that radio is the cause, although booze-radioitis is also common these days.

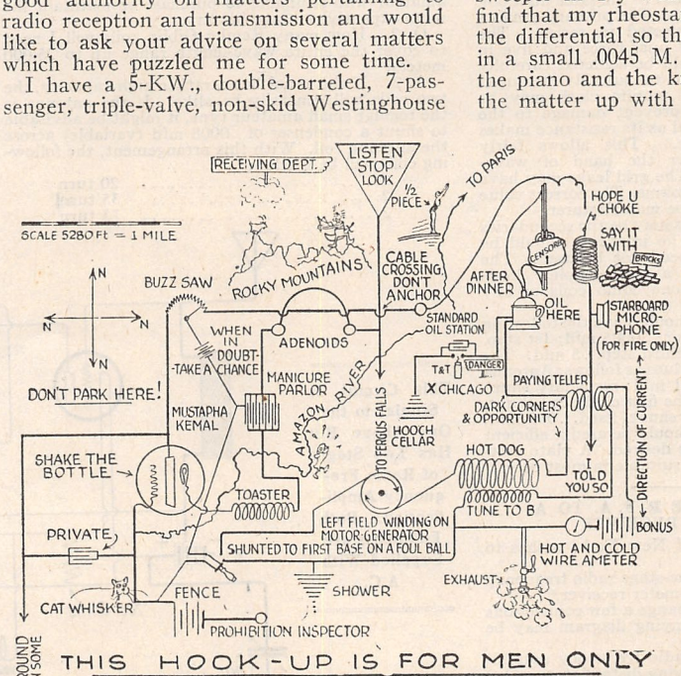
Mr. Raymond Hintgen,
c/o Wahpeton Electric Co.,
Wahpeton, N. Dak.

Dear Sir:

I have been advised that you are a pretty good authority on matters pertaining to radio reception and transmission and would like to ask your advice on several matters which have puzzled me for some time.

I have a 5-KW., double-barreled, 7-passenger, triple-valve, non-skid Westinghouse outfit, complete with U. S. safety appliances (Standard) and Timpkin rear axle, which I use in connection with a 210-volt, hammerless, self-winding, automatic, 16-jewel, nickel-plated, Marconi antenna with pneumatic tires. Have had a great deal of trouble with my Galena at night since I started using Lydia E. Pinkham's Vegetable Compound, but get better results by painting it with iodine. I can get undamped waves all right with my regenerative vacuum sweeper in dry weather, but on Sundays I find that my rheostat keeps interfering with the differential so that it is necessary to cut in a small .0045 M. F. washboard between the piano and the kitchen sink. On taking the matter up with Mr. Edison he advises that if I use cylinder records instead of my present intermittent shock absorbers on C.W., my capacity will be increased about 8½ per cent Fahrenheit, but Einstein thinks my clutch is slipping and I ought to use a little more yeast and a copper boiler. This, of course, is purely a matter of taste and I am sure you will agree with me that the overload release will work just as well with a mica commutator and a 4" x 4" coupler shank as long as the piston rings are well oiled and I use plenty of sand on the hills.

(*Cont. on page* 1220)



The Souper Regenerative Feed Back Heterodyne as Seen by the Novice.

THIS Department is conducted for the benefit of our Radio Experimenter. We shall be glad to answer here questions for the benefit of all, but we can only publish such matter as is of sufficient interest to all.

1. This Department cannot answer more than three questions for each correspondent.
2. Only one side of the sheet should be written upon; all matter should be typewritten or else written in ink. No attention paid to penciled matter.
3. Sketches, diagrams, etc., must be on separate sheets. This Department does not answer questions by mail free of charge.
4. Our Editors will be glad to answer any letter, at the rate of 25c for each question. If, however, questions entail considerable research work, intricate calculations, patent research, etc., a special charge will be made. Before we answer such questions, correspondents will be informed as to the price charge.

You will do the Editor a personal favor if you will make your letter as brief as possible.

SIX-TUBE CIRCUIT

(532) Mr. F. E. Post, of Detroit, Michigan, requests:

Q. 1. Please publish a hookup of a receiver using six tubes. Two as radio frequency amplifiers, one a detector and three as audio frequency amplifiers. Choke coils to be used in the audio frequency component. The radio frequency part should consist of transformers.

A. 1. The circuit you request is shown on these pages.

Q. 2. Please give all data which would aid me in constructing same.

A. 2. In constructing a receiver of this type, it is important to have all wiring as short as possible and all connections must be soldered. Insulation must be perfect throughout.

The tubes may all be hard amplifier tubes of low internal capacity. The radio frequency transformers may be made by having dry wooden or hard rubber forms 2" in diameter. Five grooves about ⅛" deep should be cut into this form. Each groove is separated ⅛" from each other. If the specified wire is available, a width of ⅛" will be suitable. Into each primary groove wind 40 turns of No. 40 S.C.C. wire, taking care that the wire is not broken. The secondary coils are wound with 34 turns in each secondary slot. The coils should be wound in the same direction and then connected, as follows: The primary consists of coils two and four connected in series. The secondary is formed of coils one, three and five in series. All connections should be soldered carefully and the four leads brought to suitably arranged binding posts. A sheet of empire cloth may be wrapped over the form to prevent damage to the thin wire. No. 40 wire is used as its resistance makes the coils slightly aperiodic. This allows fairly efficient transformation over the band of wavelengths 200 to 500 meters. The grid leaks may have a value between ½ and 2 megohms. The correct value is generally stated by the tube manufacturer.

The audio frequency chokes may be the secondaries of small ¼" spark coils. The iron core should be retained, but the primary need not be used. The tuner may employ either a variocoupler, loose coupler, spider web coils, honeycomb coils or any suitable form of inductances.

The fixed grid condensers should have the following approximate values. Detector, .0005 mfd; 1st step, .005 mfd; 2d step, .05 mfd; third step, .5 mfd. The other condensers may have values as follows: Antenna series coupler (variable), .001 mfd; secondary shunt variable, .0005 or .001 mfd; the first choke coil shunt, .0005 mfd; the "B" battery shunt, fixed, .005 mfd. Only the very best material should be used if efficient reception and reproduction is desired. A plate voltage of 45 to 80 will be found suitable in most cases.

ADDING ONE STAGE R. F. A. TO A VARIOMETER RECEIVER

(533) Mr. A. Rehwert, of New York, wishes to know:

Q. 1. How may I add a one-stage radio frequency amplifier to my present variometer receiver?

A. 1. If it is possible to change a few connections in the receiver, the accompanying diagram may be used.

Q. 2. Will one stage of radio frequency amplification be of much aid in receiving distant stations?

A. 2. While one stage of radio frequency amplification will be of some benefit if correctly tuned, a two or three stage amplifier will be necessary if the range is to be greatly increased. A one-stage radio frequency amplifier is not of sufficient benefit to compensate for the extra cost and upkeep.

RADIO FREQUENCY TRANSFORMERS

(534) Mr. G. A. Little, of Gainesville, Florida, writes:

Q. 1. Please publish, in RADIO NEWS, complete data for the construction of an efficient radio frequency transformer to cover the range of wavelengths between 200 and 600 meters.

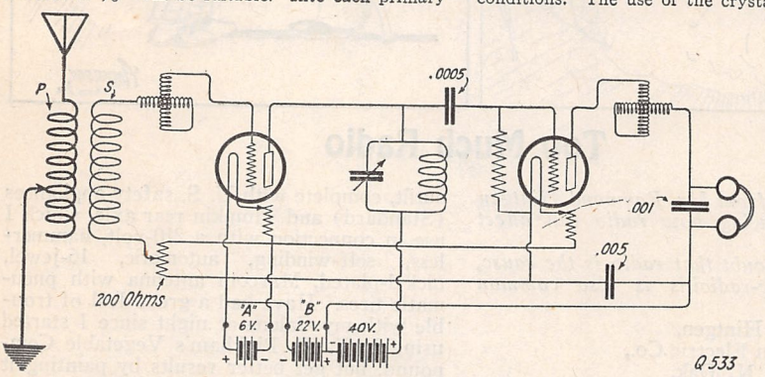
A. 1. We have given the data on a suitable transformer in answer to question 532 on this page.

A. C. FILAMENT HEATING CIRCUIT

(535) Mr. E. G. Watts, of Miami, Florida, asks:

Q. 1. Kindly publish a hookup of a set similar to that shown on page 458 of the September issue of RADIO NEWS. I wish to use a Myers RAC-3, and would like to heat the filament from the house supply of alternating current. Remler-Giblin coils are to be used throughout.

A. 1. We show the desired diagram on these pages. This circuit is quite satisfactory under favorable conditions. The use of the crystal detector aids in eliminating the hum. We also show a circuit with two radio frequency amplifying tubes. This circuit generally works well and is of special value to the amateur who is unable to purchase or maintain the more expensive storage battery.



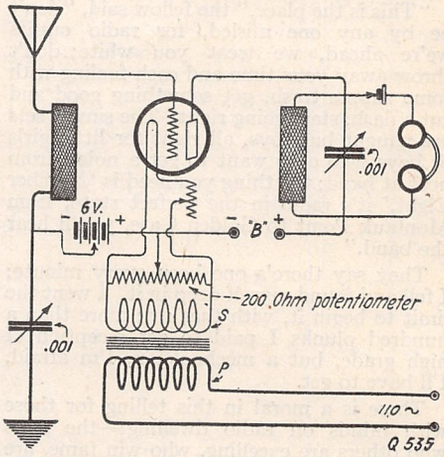
Q 533

This Two Tube Circuit Is Very Sensitive and Gives Great Amplification. The Second Tube on the Right Is the Detector.

Q. 2. How many Remler-Giblin coils will I need to cover the entire wave-length range up to 25,000 meters?

A. 2. If the aerial has a rather high capacity, the two coils will generally be alike. If the antenna is the regular small amateur type, it might be advisable to shunt a condenser of .0008 mfd (variable) across the antenna coil. With this arrangement, the following coils will be needed:

2.....	20 turn
2.....	35 turn
2.....	75 turn



Q 535

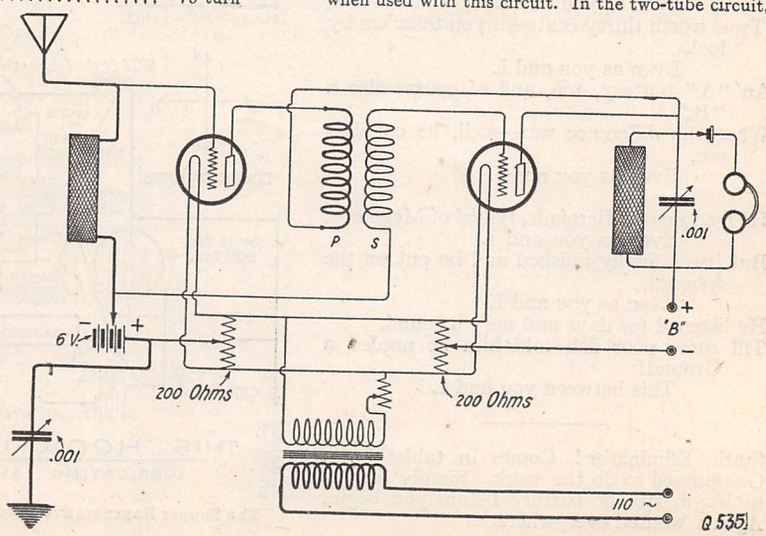
With This Circuit It Is Possible to Use A.C. to Light the Filament of the Tube Which Acts as Radio Frequency Amplifier.

2.....	150 turn
2.....	300 turn
2.....	750 turn
2.....	1500 turn

It is possible to cover the range with fewer coils but the above list allows considerable overlap on each set of coils.

Q. 3. Please give me some operating information relative to this circuit.

A. 3. The set is tuned in a manner similar to a loose coupled-crystal set. The antenna coil and condenser forming the primary circuit and the plate coil of the last tube together with the shunt variable forms the secondary circuit. The coupling between the coils should generally be the least possible though there is some advantage in being able to couple them closely if desired. The slider on the potentiometer or potentiometers should be placed near the center and the A. C. hum is cut to an almost inaudible strength. Having tuned in a station which is operating long enough to allow tests, vary the voltage of the "C" battery for maximum signal strength and lowest A. C. hum. The crystal should be adjusted in the regular manner for the best "spot." The condenser should be placed in the ground circuit rather than in the antenna circuit. We have found this to be slightly superior than when the direct ground connection is employed. A counterpoise often gives better results and helps in reducing the A. C. hum when used with this circuit. In the two-tube circuit,



Q 535

This Circuit Is Similar to the One Above But Has Two Stages of Radio Frequency Amplification. Both Filaments are Supplied With A.C.

the radio frequency transformer may be similar to that described in Q. 532. It will be necessary to use different transformers for reception over 500 meters.

In all cases, hard tubes should be used and preference should be given those tubes having a low value of internal capacity. Do not be discouraged if the set does not work well at the first trial. It is possible to secure good operation with care and practice.

TUBES

(536) Mr. J. J. O'Callaghan, of Cincinnati, Ohio, writes:

Q. 1. What is the proper sized grid leak and grid condenser for the Westinghouse "WO-11" Tube?

A. 1. We have found a grid condenser of .0005 mfd to give good results with most aeriotron tubes. The leak should be variable for best results, though a value of one or two megohms will be correct for average work.

Q. 2. Are the Western Electric 216-A tubes and the Signal Corps V.T.-2 tubes exactly alike?

A. 2. No. The L tube (216-A) is quite different from the E (V.T.-2) tube.

Q. 3. Where may I obtain an "N" tube?

A. 3. These tubes are not obtainable in this country.

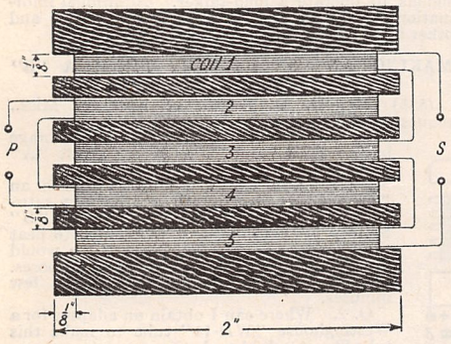
CIRCUIT DIAGRAM

(537) Mr. C. Kerr, of Franklin, Pa., requests:

Q. 1. Please publish a circuit diagram of the Clapp-Eastham Receiver.

A. 1. The single circuit Clapp-Eastham receiver is similar to that shown in answer to Q. 499 in October issue of RADIO NEWS.

Q. 2. Is it better to use a vernier condenser in shunt or in series to the main antenna condenser?



40 turns in each slot for primary
34 turns in each slot for secondary Q 534

Constructional Details of a R.F. Transformer, Which May Easily Be Built by the Amateur.

A 2. A vernier condenser is generally placed in shunt to the large condenser.

ELECTROLYTIC BATTERY CHARGER

(538) Mr. C. Fedell, of Frontenac, Kansas, writes:

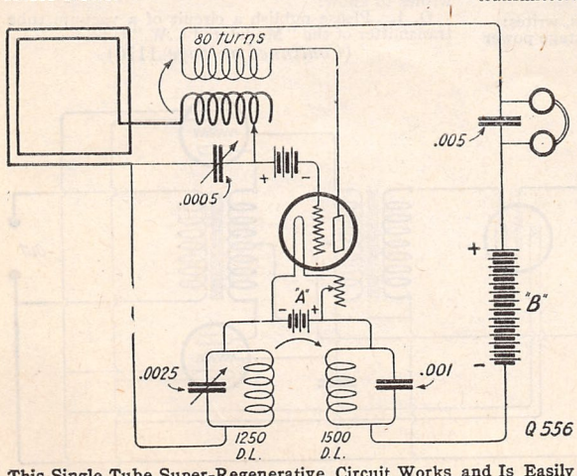
Q. 1. I have carefully made an electrolytic rectifier as specified in the "I-Want-To-Know" Department. As yet, I have had no success with same. Is there anything I could do to make the rectifier work properly?

A. 1. We would suggest that the A.C. current be connected directly to the rectifier instead of going through the lamp bank. The lamp bank may be placed in series with the storage battery to regulate the charging rate. The lead and aluminum plates should be spaced about one and one-half inches apart. It is advisable and necessary to use the largest jars obtainable. The type supplied with stationary battery installations will be satisfactory.

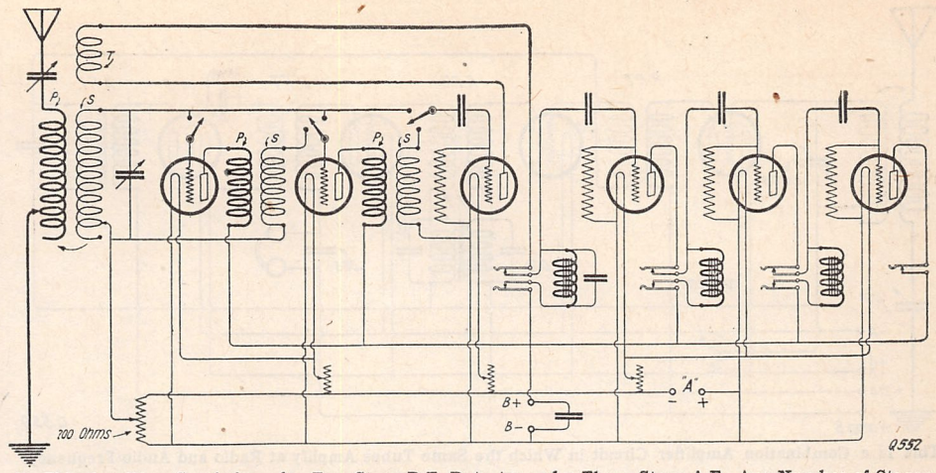
CRYSTAL DETECTOR

(539) Mr. C. Rowe, of Greenview, Illinois, asks:

Q. 1. Where may I purchase the crystal detector described on page 102 of the August, 1921, issue of RADIO NEWS?



This Single Tube Super-Regenerative Circuit Works and Is Easily Assembled. With a 100 to 200 Volt "B" Battery a Loud Speaker May Be Used.



In This Amplifier Consisting of a Two-Stage R.F. Detector and a Three-Stage A.F., Any Number of Stages of R.F. Can Be Used by Means of S.P.S.T. Switches. The A.F. Amplifier Is of the Choke Coil Type.

A. 1. You may obtain this unique crystal stand at G. Pericaud, 85 Blvd. Voltaire, Paris, France. They will also be able to supply the specifications and cost of same.

"WD-11" VACUUM TUBE

(540) Mr. R. Nowell, of Kansas, writes for information:

Q. 1. What plate voltage is used with the Westinghouse peanut tube?

A. 1. A plate voltage of 20 to 25 will generally be found suitable. Plate voltages over 30 should not be employed. The plate voltage of this tube is not critical and an ordinary block "B" battery of 22.5 volts may be used.

Q. 2. Does this tube fit a standard V.T. socket?

A. 2. No. The base is of such construction that it is impossible to use the regular V.T. socket. A few descriptions of special sockets for this tube have appeared in RADIO NEWS.

Q. 3. Are these tubes on the market yet?

A. 3. We believe that the "WD-11" tube may now be purchased separate from the Westinghouse tuner.

AMPLIFIER CIRCUIT

(541) Mr. W. H. Forkes, of Tucson, Arizona, writes:

Q. 1. What range may be expected from a standard variometer regenerative receiver?

A. 1. The range of any receiving set depends upon many variable factors and a definite statement cannot be made. The power of the transmitter is a determining factor and the skill of the operator, the efficiency of both receiving and transmitting apparatus and local conditions must also be taken into consideration. The diagram of a two-stage amplifier which you requested may be found in the November issue under this department. The variometer circuit appeared in our April-May, 1922, issue.

LOW POWER PHONE TRANSMITTER

(542) Mr. L. Noarse, of Belcher, Louisiana, writes:

Q. 1. Please publish a diagram of untuned radio telephone transmitter to cover a two-mile range.

A. 1. The single circuit receiver shown in answer to Q. 499 in the October, 1922, issue of RADIO NEWS may be employed. Use a hard tube with about 100 volts on the plate. It will be necessary to tune this transmitter as every radiophone transmitter must be tuned and adjusted for best results. The only addition to this circuit will be a modulation transformer. The secondary of the transformer should be shunted across the grid condenser. The primary is connected in series with a six-volt battery and a microphone.

Q. 2. Would a license be required with such a transmitter? I live in the country and would bother no one.

A. 2. Yes. It will be necessary to obtain an amateur operator's license before the station license. Both licenses are quite easy to obtain. You may encounter difficulty and trouble from the government if the station (no matter how great or small the power) is unlicensed. We would advise that you write the nearest radio inspector and secure additional data relative to amateur licenses.

A.C. FILAMENT SUPPLY

(543) Mr. J. G. Martin, of Detroit, Michigan asks:

Q. 1. I am enclosing a circuit of a detector and two-stage audio frequency amplifier. Six-volt alternating current supplied from a step-down transformer operating on 110-volt house current is used to heat the filaments of all three tubes. Would this circuit function well?

A. 1. No. The use of A.C. on the filaments of a standard two-stage amplifier is rarely satisfactory. A loud disagreeable hum corresponding to the cyclage of the line current will be heard. The hum is of sufficient strength to make radio signals inaudible. A.C. may be used on the filaments of a detector tube alone with some degree of success. A diagram and explanation appeared in the November, 1922, RADIO NEWS. There were several errors in your diagram but we are speaking of the corrected circuit.

Q. 2. How may I reduce 8 volts to 6 volts or less?

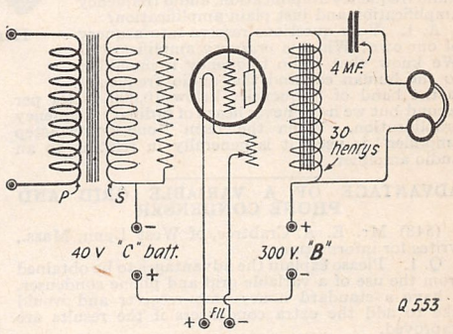
A. 2. A 10-ohm rheostat in series with the 8-volt supply will furnish the desired output control.

CONDENSER VALUES

(544) Mr. T. Guyer, of Philadelphia, Pa., wishes to know:

Q. 1. Will you kindly give me the condenser values in the circuit of Q. 421, August, 1922, RADIO NEWS? I would appreciate all information relative to this circuit.

A. 1. From left to right in that diagram, the condenser values are as follows: Antenna series condenser is .001 mfd; the variable across the coil in the tuned plate of the first tube may be .0005 or .001 mfd. The first grid condenser may be fixed and of .001 mfd capacity. The condenser shunting the first choke may be of .0005 mfd. The second grid condenser may be .005 mfd and the last grid condenser may be .01 or .05 mfd. The grid condenser may be fixed or variable of ½ to 2 megohms, depending upon the tubes. The choke coils may be the secondaries of old spark coils, ¼" size being suitable. Chokes especially for this purpose may be purchased on the market. A value of 200 ohms may be used as the potentiometer controlling the grid potential of the first or radio frequency amplifying tube.



If You Want to Operate a Loud Speaker at Full Volume Hook Up a One-Stage Power Amplifier After Your Regular Two-Steps. This Is the Circuit.

PHONE POLARITY

(545) Mr. A. L. Franklin, of Chickasha, Oklahoma, writes:

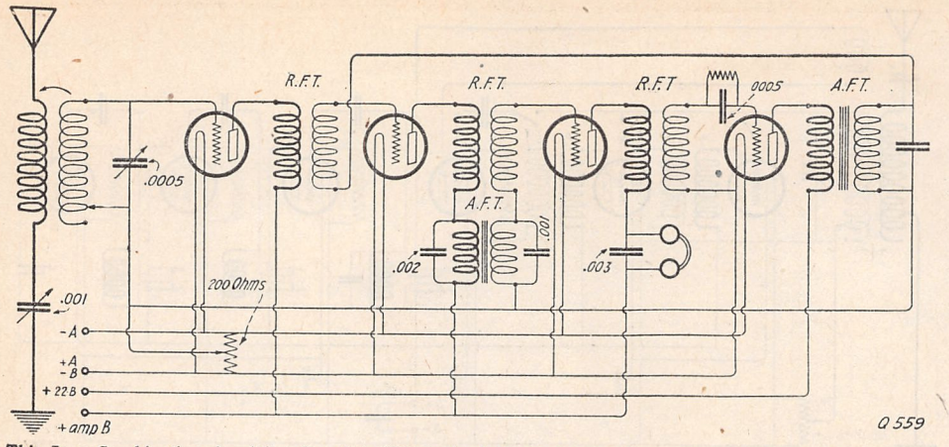
Q. 1. Why is it that I cannot receive 485 meter stations with my equipment? The set is composed of two good variometers, a variocoupler and the necessary extras. The circuit is a standard regenerative circuit and I can receive the 360 meter stations very well. I also have a .001 mfd variable condenser shunted across the secondary.

A. 1. The description of the apparatus shows that it should be possible to receive waves up to at least 500 meters. It may be that there are no 485-meter stations within range. If you are able to receive 360-meter stations, there is no reason why you should not also receive 485-meter stations.

Q. 2. I have a Baldwin type "C" phone. Should this phone be connected in a certain direction with relation to the plate current?

A. 2. Yes. It would be well to connect the phones in the proper manner. A good article on this subject with a method of determining the correct polarity appeared in the February, 1922, issue of RADIO NEWS.

Q. 3. I have a two-stage amplifier and wish to add another step. Will the additional amplification be of sufficient benefit to warrant the expense? Will the Baldwin phone be liable to damage if loud signals are received?



This Is a Combination Amplifier Circuit in Which the Same Tubes Amplify at Radio and Audio Frequency.

A. 3. If the third stage is carefully built, the resulting amplification will surely be worth the expenditure. We would advise that a small power tube be employed in this unit. If a six-volt battery is used for filament supply, no rheostat will be necessary. A plate voltage of about 100 generally gives good results. The Baldwin phone should be able to stand the additional amplification without injury.

R. F. T.

(546) Mr. R. Balcom, of Pawtucket, Rhode Island, writes:

Q. 1. Would a four-stage radio frequency amplifier do twice the work of a two-stage?

A. 1. There would be considerable superiority of the four-tube set over the two-tube amplifier. Much better results may be expected if the design and construction are perfect.

Q. 2. Please name the three best R. F. T.'s on the market.

A. 2. It is against RADIO NEWS policy to quote manufacturers' names in answer to published queries. We would advise that you follow out carefully the "Laboratory" report each month, as there will be radio frequency apparatus tested shortly. Of course, it must be remembered that many manufacturers have not availed themselves of the benefits of our Laboratories and though their apparatus has not been awarded a "Certificate of Merit," still it may be entirely satisfactory.

RADIO, AUDIO AND "ORDINARY" AMPLIFICATION

(547) Mr. J. D. Faust, of West Virginia, writes:

Q. 1. What is the difference between radio frequency amplification, audio frequency amplification and just plain amplification?

A. 1. Your questions resolve into a query of our own: What is *ordinary* amplification? We know that radio frequency is inaudible to the human ear and that audio frequency is the band of frequencies below 10,000 cycles per second but we have never heard of ordinary frequency amplification. When the term "one or two-step amplifier" is used, it is generally in relation to an audio amplifier.

ADVANTAGE OF A VARIABLE GRID AND PHONE CONDENSER

(548) Mr. E. A. Crabtree, of West Lynn, Mass., writes for information:

Q. 1. Please explain the advantages to be obtained from the use of a variable grid and phone condenser. I have a standard honeycomb receiver and would like to add the extra condensers if the results are improved.

A. 1. It is not necessary to have either a variable grid or phone condenser for good operation. However, with *either* a variable grid or a variable phone condenser, the regenerative control is very precise and the adjustment for loudest signals may be obtained readily. Only one of the two is necessary for this purpose. We would suggest that, if an extra variable is on hand, it be used as the grid condenser.

CRYSTAL CIRCUIT

(549) Mr. W. E. Grier, of Washington, D. C., requests:

Q. 1. I wish to construct an efficient crystal set. Will you please publish the best crystal circuit you know of?

A. 1. The circuit you request appeared in our October issue in answer to Q. 469. The answer to this query contained much information relative to crystal receiver design. In the same issue there was much information on crystals and crystal stands.

ONE-STEP AMPLIFIER

(550) Mr. C. R. Terhune, of Franklin, Indiana, requests:

Q. 1. Please give me a hookup for one stage of amplification with a crystal detector.

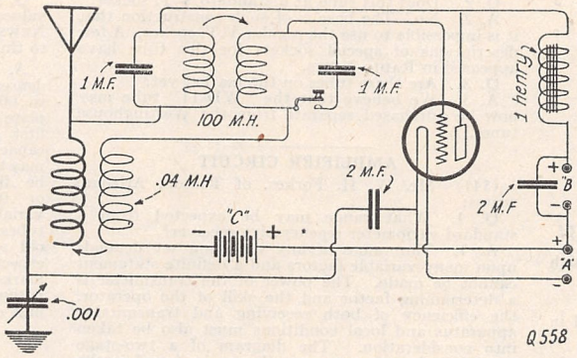
A. 1. You may use the circuit given in answer to Q. 497 of the October issue. The portion in the dotted enclosure, marked "One-Step Audio F.A.," is the desired circuit. Jacks are shown in this diagram, and, by their use, either detector alone or both detector and one-step amplifier may be used. The circuit for a vacuum tube detector is also given with this diagram and you may use same if you wish to change from crystal to vacuum tube detector.

POWER LOUD-TALKER

(551) Mr. A. Melching, of Philadelphia, Pennsylvania, writes:

Q. 1. I have had considerable difficulty in constructing an efficient power loud-talker. Will you please publish the data on this type of loud-talker?

A. 1. A power loud-talker is quite difficult to construct, and the constructional details take too much space to reprint here. Our October, 1920, RADIO NEWS contained a lengthy and very interesting article relative to this subject. We would advise that you secure a copy of that issue. It is always well to inspect past issues of RADIO NEWS when searching for information, as most of the queries being received by this department have been answered in previous numbers.



Here Is a Small Power C.W. Transmitter Producing Modulated Waves.

AUTOMATIC FILAMENT CONTROL

(552) Mr. R. Feitshans, of Laura, Ohio, wishes to know:

Q. 1. Will choke coil amplifiers with Myers tubes give amplification equal to that of a standard transformer coupled amplifier?

A. 1. If we assume that both sets are designed correctly with respect to the tubes employed, then the results should be about equal.

Q. 2. Where may I obtain the automatic filament current adjuster shown on page 28 of the July, 1922, issue of RADIO NEWS?

A. 2. We believe you may obtain these units from the Radiall Company, 99 Warren Street, New York City.

ONE-STAGE POWER AMPLIFIER

(553) Mr. J. Haan, of Chicago, Illinois, writes:

Q. 1. Please publish hookup of a one-stage power amplifier using a standard five-watt tube.

A. 1. The circuit you request is shown on these pages. A standard audio frequency transformer may be used as the input transformer. The choke coil should have a value of 30 henries or more. The primary of a Wayne bell-ringing transformer will be suitable. No filament rheostat is necessary if only a six-volt filament battery is used. The rheostat and socket should be of heavy construction to stand the high current. All leads should be of thick copper securely soldered. A plate voltage of 100 will be satisfactory, but more amplification may be obtained with a high-plate voltage. The action and purpose of the shunt phone and condenser is quite simple. The direct current from the "B" battery flows through the choke coil as the condenser acts as a stop in the phone circuit. Alternating current, however, takes the path through the high capacity condenser and the phones. The alternating current does this because the impedance of the condenser and phone is less than the impedance of the choke coil.

THE "SUPER"

(554) Mr. S. A. Glenn, of Boston, Massachusetts, wishes to know:

Q. 1. Are the plate and grid coils of the Armstrong Super-Regenerative receiver in inductive relation?

A. 1. Yes. The large coils in this type of receiver should have a variable coupling for best results, if only two coils are used.

Q. 2. Are the grid batteries necessary?

A. 2. For best operation, the grid batteries are quite essential. The batteries should have a variable voltage range in 1.5 volt steps.

Q. 3. Will this receiver bring in broadcasting stations at a distance of 25 miles with sufficient intensity to operate a loud-speaker?

A. 3. Under favorable conditions, and with proper tuning, it should be possible to secure loud enough signals to operate a loud-talker. Additional information relative to this circuit appears in this and other issues of RADIO NEWS.

MAKING AN "A" BATTERY FROM A "B" BATTERY

(555) Mr. G. D. Booth, of Natchez, Miss., requests:

Q. 1. Can I use three two-volt storage batteries "B" units to make a six-volt "A" battery?

A. 1. You can make and use such an "A" battery, but it will not be very satisfactory. The amperage of a storage "B" battery is very low, and when used to heat the filament of a regular six-volt tube, would run down too quickly for practical purposes. In fact, the charge would last only a few minutes.

Q. 2. Where can I obtain an adapter for a Westinghouse "WD-11" tube to make this tube fit a standard socket?

A. 2. Such adapters are now on the market.

SUPER-REGENERATION WITH ONE TUBE

(556) Mr. Dougherty, of Ault, Colorado, requests:

Q. 1. Please publish a diagram of one tube super-regenerative receiver.

A. 1. The diagram you request is shown on these pages. The regenerative coupler should be especially constructed for this circuit. The rotor is wound with 80 turns. The tuning inductance may consist of 30 turns tapped every five turns. The "C" battery voltage should be variable in steps of 1.5 volts. A five-watt power tube generally works well.

POWER AMPLIFIER

(557) Mr. R. Smith, of New York, requests:

Q. 1. Please publish a diagram of the Western Electric loud-talker. I believe this equipment consists of three power tubes.

A. 1. The circuit you request is shown on these pages. It will be noted that special transformers are required. They should be designed to operate with standard five-watt power tubes. The diagram of a two-stage power amplifier, published in the April-May issue of RADIO NEWS, requires fewer special parts.

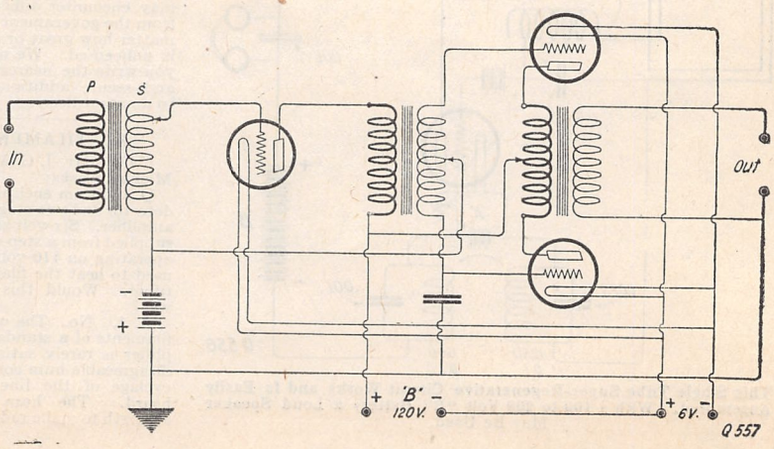
MODULATED C.W.

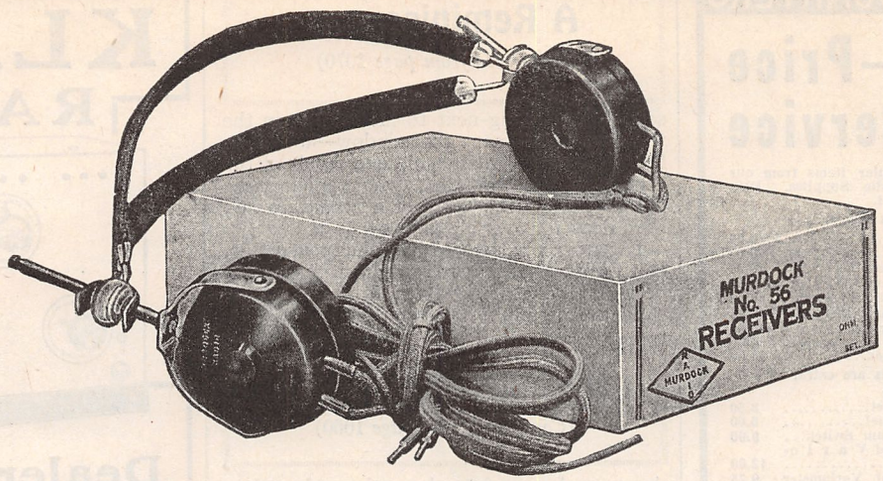
(558) Mr. R. Elliott, of Chatham, Massachusetts, wishes to know:

Q. 1. Please publish a circuit of a vacuum tube transmitter of the "Modulated C.W." type.

(*Continued on page* 1116)

This Circuit Is of a Power Amplifier Designed on the Pull-Push System. This Circuit Is Used in the Western Electric Power Amplifier and Can Handle a Great Amount of Energy.





$5.00
2000 OHMS

$5.50
3000 OHMS

MURDOCK HEADSETS *for* CHRISTMAS

CAN you think of a better Christmas gift to a radio enthusiast?

Whether he is an expert, an amateur or just a real radio enthusiast, he is familar with the name Murdock. It means a quality headset to him—one that is guaranteed to give satisfaction.

You are taking no chances when you choose a Murdock—they have been used by experts almost from the inception of radio experiments. For over seventeen years Murdock Radio Headsets have been sold all over the civilized world.

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MURDOCK RADIO

STANDARD APPARATUS SINCE 1904

RADIO HEADQUARTERS

Quality—Price Prompt Service

We list below a few popular items from our large stock of standard Radio Supplies. Play safe—buy standard equipment.

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Westinghouse RC Receiver	$132.50
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Westinghouse DA 2-Stage Amplifier	70.00
Clapp-Eastham RZ Receiver-Amplifier	100.00
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Clapp-Eastham HZ 2-Stage Amplifier	40.00
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Tubes, Batteries and Phones are extra, except as noted.

Remler No. 330 Detector Panel	8.50
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Remler No. 333 Same with Cam Switch	9.00
Remler No. 505 Panel-mounted Variocoupler	12.00
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Remler No. 501 Same with No. 100 Knob and Dial	7.50
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Chelsea No. 2 23-Plate Var. Condenser, mounted	4.50
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ABC No. 650-11 11-Plate Var. Condenser	3.00
ABC No. 650- 3 3-Plate Var. Condenser	2.25
Radion 3-inch Dial	.75
Radion 4-inch Dial	1.00
Moulded Bakelite 3-inch Dial	.75
Cunningham C-300 or Radiotron U. V. 200 Detector Tube	5.00
Cunningham C-301, Radiotron UV201 Amplif. Tube	6.50
Cunningham C302 or Radiotron U. V. 202 Power Tube	8.00
Jefferson No. 48 Tube Socket	1.00
R.C. UT-541 Porcelain Tube Socket	2.50
Signal R-75 Tube Socket	1.00
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Remler No. 810 Jr. Filament Rheostat	1.00
Remler 1½-Amp. Panel Rheostat No. 811	1.75
Remler 3-Amp. Panel Rheostat No. 813	1.75
Paragon No. 1023 Panel Rheostat	1.50
Bradleystat Filament Controller	1.85
R.C. PR-535 Rheostat	3.00
Cutler-Hammer H-1 Vernier Rheostat	1.50
Cutler-Hammer H-2 Plain Rheostat	1.00
R.C. PR-536 "A" Battery Potentiometer	2.00
Batteries	See our Catalogue
Frost Fones No. 162, 2000 ohms	5.00
Frost Fones No. 163, 3000 ohms	6.00
Murdock No. 56 Phones, 2000 ohms	5.00
Murdock No. 56 Phones, 3000 ohms	5.50
Baldwin Type C Phones	16.00
Baldwin Type E Phones	16.00
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Western Electric Phones	15.00
Westinghouse Vocarola	30.00
Magnavox R-3, 14-Inch Horn	45.00
Acme A-2 Amplifying Transformer, mounted	7.00
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Jefferson No. 41 Amplifying Transformer	4.25
Jefferson No. 45 Amplifying Transformer	7.00
R.C. UV-712 Amplifying Transformer	7.00
Murdock No. 358 .0007 Mfd. Fixed Cond.	.70
Federal No. 15 Universal Plug	1.25
Frost No. 132 Plug	1.00
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Frost No. 135 Jack	1.00
Frost No. 136 Jack	1.25
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Remler Standardized Switch Parts	See our Catalogue
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Brach No. 223 Outdoor Vacuum Gap Protector	3.00
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FREE CATALOG illustrated, sent on request.

Dealers—Buy reliable equipment from a house of established reputation. Send for catalog of tested and approved apparatus and our discount sheet.

IN BUSINESS SINCE 1860

JULIUS ANDRAE & SONS CO.
117 MICHIGAN ST. MILWAUKEE, WIS.

A Reminiscence

(*Continued from page* 1070)

school boy sitting next to his mother in the third row left—near the window—would be flying through the air and, as a result of the invention just revealed, would pick right out of the air the voice of a man who had been dead for over a year!

I wonder what would have happened. . . But I know that a mere century or two before he would have promptly been burned at the stake on the public square.

His Mistress' Voice

(*Continued from page* 1060)

the one who receives the artists when they come to the studio and makes the arrangements for their performance and their comfort. It is a generally accepted fact that the artistic temperament rebels against unpleasant conditions, so the ability to tactfully put the entertainer at ease, cause him or her to feel the cordiality of the studio atmosphere, make him glad to give pleasure and anxious to give again, and above all provide the harmony necessary for a really fine performance—all this indicates that announcers cannot be chosen in a haphazard fashion, but must be selected with great care.

It is a popular superstition that every home should have a hostess, be the host ever so model a man, and so two of the big stations in the Metropolitan district, call station WOR belonging to the Bamberger Department Store in Newark, and WBAY, the new toll station of the American Telephone and Telegraph Company of New York City, have each, as an important member of their staffs, a "lady" announcer.

Miss Jessie E. Koewing, known to listeners-in as Announcer JEK, has been in complete charge of the Bamberger programs since their inception, and she seems to possess all the qualities necessary for the job. In the first place she is herself a violinist of ability, which gives her the requisite feeling for things musical. During the war she served as hostess with the Y. M. C. A. in France, and helping to plan entertainments caused her to meet countless performers of all types. This wide acquaintance is supplemented by the musicians whom she met in the course of her studies at the Institute of Musical Art. The work abroad also brought into play her own ability to entertain, her tact as a hostess, and her knowledge of how to plan programs. And the engaging personality of this tall young lady with the wealth of brown hair, and her frank open countenance is at once manifest.

"I feel," she said to me, "that it is the personal touch I am able to give the work here because of my acquaintance with all these people that has made it so successful. They come here as my friends, and as I am in constant communication with my listeners-in they immediately become their friends also."

Many offers of service have come from people who were amazed to hear a woman's voice announcing, and immediately wrote to her. This happened in the case of the late "flying parson." On the very afternoon that he met his unfortunate death, Miss Koewing was telling me how, when he was flying over Schenectady, Lt. Maynard heard a woman's voice announcing, discovered it was she, and wrote to her. The result was an invitation which he accepted, to broadcast from WOR.

Miss Koewing is most enthusiastic about the mail she receives from her huge audiences.

KLAUS RADIO

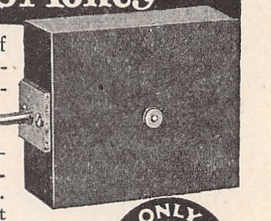
Dealers—Write!

Get our special dealer proposition before you place orders anywhere.

Prompt shipments. Prices are right. Write for complete list of Radio Corporation of America apparatus and other standard lines.

KLAUS RADIO & ELECTRIC CO.
Authorized Distributors
Dept. 200 - EUREKA, ILLINOIS

A Better Condenser for Less Money



Don't pay out a lot of good money for an old-style *Variable Condenser* when you can get the new, tested "*Vermica*" for half—get two Variable Condensers for the price of one.

ONLY $1.75 POSTPAID

The "*Vermica*" is the latest development in Variable Condensers—sharper tuning—closer adjustment—impossible to short or get out of order—takes up less room on panel, also suitable for board mounting. Capacity .0005 MF. Made of extra-seasoned hard ply-wood, phosphor-bronze and copper. Endorsed by leading Radio authorities and sent on an absolute guarantee of complete satisfaction or money refunded. **Order from us if your dealer can't supply.**

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but don't know where to buy it.

YOU WANT TO MAKE A GIFT
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No charge for our service

SERVICE EXCHANGE
AMSTERDAM ∴ OHIO
"The Radio City"

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The Complete Radio Educator
Official and Reliable Radio Data from U. S. Bureau of Standards

Covers the full ground of regular $40 to $75 training course. Explains Radio Telegraphy, Radio Telephony and Vacuum Tubes. Bound in full cloth 4 1-2 x 7 1-4 inches, 352 pages. Order Now Costs only $1.00.

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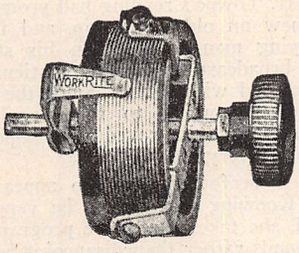
WORKRITE

Products WorkRite



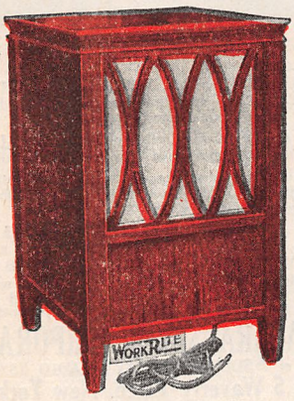
Patent Applied for

WorkRite Super Vernier Rheostat

50,000 Adjustments

Here is a REAL Rheostat—something entirely new and very much needed. Indistinct and mushy music can be brought out clear and loud by tuning with this Rheostat. Pushing the knob way in turns off bulb. Quick adjustment anywhere between 6½ ohms and zero, or by turning the knob you can get 50,000 different adjustments. **Positively Never Gets Hot.** Screws for mounting on panel furnished. The WorkRite Super Rheostat is really remarkable in its performance and will double the audibility of distant concerts. Price, **$1.50**

BEFORE BUILDING YOUR SET SEND FOR OUR FREE CATALOG



CONCERTOLA SR.

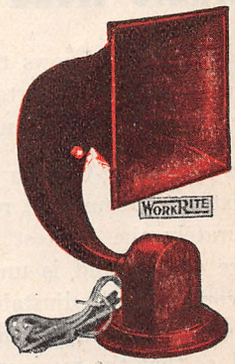
WORKRITE CONCERTOLAS

The Ideal Christmas Present that the whole family will enjoy!

Hundreds of thousands of radio fans who have used WorkRite Radio Products know that "WorkRite" means perfection.

Except for the phone units, THERE IS NOT THE SLIGHTEST METAL IN EITHER THE WORKRITE CONCERTOLA JR. OR SR. The sound chambers of the Concertolas are made from our specially prepared material, which reproduces voice or music in a clear, loud tone without the slightest distortion. No "tin-panny" metal horn to lose the beautiful tones of the artists.

A SPECIAL concert phone unit has been developed by our engineers for use in the WorkRite Concertolas, producing a combination that is unequaled. This special phone unit is not sold separately.



CONCERTOLA JR.

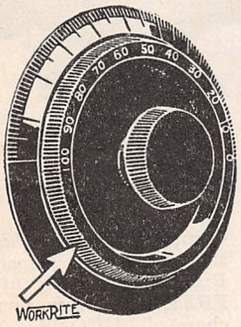
The WorkRite Concertola Senior is built from numerous plies of the finest mahogany, oil rubbed and finished exactly like your piano. 10" square and 15" high. Place on your library table and run wires to your set in any part of the house.

If you have a good receiving set and two steps of Amplification these Concertolas will give you wonderful results

WorkRite Concertola Sr. with phone and cord..... **$24.00**

WorkRite Concertola Jr. with phone and cord..... **$12.00**

WORKRITE E-Z-TUNE DIAL FITS THE HAND



When you want to get very fine adjustment on your variometers, variocouplers, condensers, etc., you always grasp your dial on the outer edge for more leverage. Right there is where you will find a knurled flange that just fits your grasp on the WorkRite E-Z-Tune Dial. You can readily make a turn of a hair's breadth.

Made of the finest material, highly polished. Easily the "snappiest" dial on the market. 3½" diameter. Specify whether 3/16" or ¼" shaft.

Price..... **75c**

WORKRITE CONCERT HEADSET LIGHT BUT STURDY

There are good, bad and indifferent phones on the market. Anyone can make big claims for their phones; but the proof of the pudding is in the eating. All we ask: TRY THE WORKRITE CONCERT PHONES SIDE BY SIDE WITH ANY OTHER—then you will know which is better. Our new sanitary headband is covered with strong celluloid which is easily cleaned. Phone cases made from aluminum. Magnets made and arranged for 100% efficiency. Extremely sensitive and free from distortion. Complete weight, 12 ounces. Price, complete with cord..... **$8.50**

INSIST ON WORKRITE PARTS FROM YOUR DEALER

THE WORKRITE MANUFACTURING COMPANY

5536 EUCLID AVENUE - - - - - CLEVELAND, OHIO

Branch Office, 2204 Michigan Avenue, Chicago

"Hearing the Bedtime Stories"

With His Big Brother's

Stromberg-Carlson Radio Head Set

this little fellow knows the enjoyment of wireless entertainment—stories, music, baseball news, etc.

This Stromberg-Carlson Head Set is extremely sensitive, reproduces accurately the faintest long distance signals, and is unsurpassed for comfort and adjustability. It is specially designed, with a forked cord, so that the receivers may be separated, thus permitting two persons to "listen in" simultaneously with the one head set.

Made by a firm with 28 years' experience in designing and manufacturing high-grade telephone and radio apparatus.

Other Stromberg-Carlson specialties include the "Universal Radio Plug" and various styles of "Radio Jacks" all of which are quickly attachable to all standard equipment.

Stromberg-Carlson apparatus may be obtained from your electrical merchandise dealer, or write for free bulletin No. 1029R, describing exclusive Stromberg-Carlson features.

Stromberg-Carlson Telephone Mfg. Co.

Rochester, N. Y.

"It keeps one constantly inspired," she said, "because they tell one so many interesting stories of the effect of the concerts. Charles Hanson Towne, the poet, was here one night and read some of his poems, among them 'Around the Corner.' A man wrote that it made him think of an old friend of his who lived just 'around the corner' and whom he had not seen in years. He went to call and found the man dying of tuberculosis. The visitor explained how Mr. Towne's reading had prompted him to renew an old friendship, and interested the dying man so much in his stories of radio broadcasting that the patient had to be provided with a set. Since the concerts have been coming to him regularly his morale has so improved that hope is felt of his recovery."

When performers fail to appear, which Miss Koewing declares to be very seldom indeed, she takes the entire program on her own hands rather than disappoint her listeners. On one occasion, stranded at the last moment, she rushed into the victrola department, and returning with an armful of records, spent the next hour telling stories of the opera, and playing illustrative records. One Monday night, with about ten minutes of her alloted time left and nothing to do, Miss Koewing called her army experience to the fore, and suggested that the small group of studio guests have a "cummunity sing," and asked the listeners-in to join them. This proved so delightful that the fans requested her to make it a regular feature of her programs.

Although Miss Koewing has the pleasure of working with a new and powerful station, her studio is still a temporary one. In this matter she is surpassed by her friendly rival, Miss Helen M. Hann of Station WBAY. As Miss Hann's work only started in August, and has been largely experimental at that, her experiences up to date are rather limited. The pleasantest part of her task has been the furnishing and decorating of the reception room and the broadcasting studio. For a young woman only twenty-one years of age she has shown remarkably good taste and both rooms are very charming. The company decided that visitors in the studio hampered the artist, so two rooms were decided upon. The reception room is furnished in walnut reed, with a library table, easy chairs and settee. Only three colors appear in Miss Hann's lovely color scheme in the studio—tan, brown and rose. These displayed in lamps, upholstery and drapes, and accentuated by rich mahogany furniture, give the effect of a very pleasant music room in a private home. There is a grand piano, a victrola, a Welte-Mignon player-piano attachment, a music cabinet—nothing mechanical about the place until one discovers on a side table a harmless looking object which, of course is a microphone.

Miss Hann was chosen for her position because she is both a pianist and a singer, and so frequently sings into the transmitter herself, and accompanies others. Her smooth deep speaking voice has already become a source of pleasure to listeners-in. In the afternoon she does most of the announcing, but in the evening she is hostess. Chairs are carried into a large room which is fitted-up with an amplifier, and here she and the many guests hear the concert which is being broadcasted in the next room.

One thing I discovered that should make the woman-less forces at the other stations very jealous—where the ladies are, the parties are!

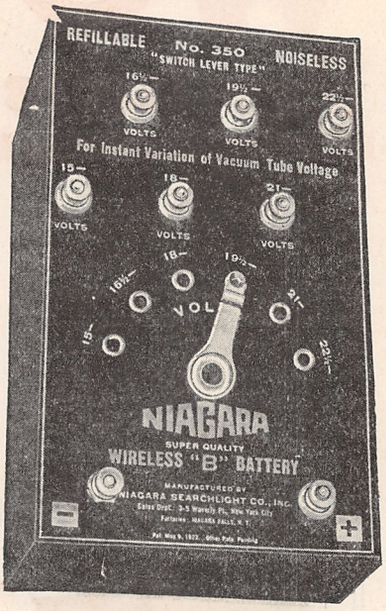
"We're a big social crowd," said Mr. Ross, musical director at WBAY, "and every Thursday night is a party."

"We broadcast from eight to nine every Monday night," said Miss Koewing, "and then we go down to the restaurant and have a regular party!"

OH! WHAT A DIFFERENCE

***Here is the New* NIAGARA "SWITCH LEVER" "B" BATTERY**

The *modern* "B" Battery you have been wishing for



STOP FUSSING WITH BATTERY CLIPS OR CONNECTOR LEADS.
SELECT AND CHANGE VOLTAGE INSTANTLY. JUST MOVE THE special patented SWITCH LEVER to proper contact point—and there you are!
Twice the Life of the Ordinary "B" Battery. Large Cells Scientifically Proportioned Ingredients for Radio Service
Refillable of course like ALL NIAGARA Batteries and Noiseless too. The Most Handsome and Efficient "B" Battery Manufactured.

LIST PRICE ONLY $3.50 EACH
15 cells—22½ volts. Size 7"x 4¼" x 3"
ASK YOUR DEALER or WRITE TO US DIRECT
TO DEALERS—This will be the fastest selling "B" Battery. Immediate deliveries. Get behind this wonderful new item. Write for our liberal proposition now.

NIAGARA SALES CORPORATION
Mfgrs of "SUPER QUALITY" RADIO ESSENTIALS
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Micon TESTED MICA CONDENSERS

Assure
Absolute Noiselessness
Clarity of Tone
Accuracy
Constant Fixed Capacity

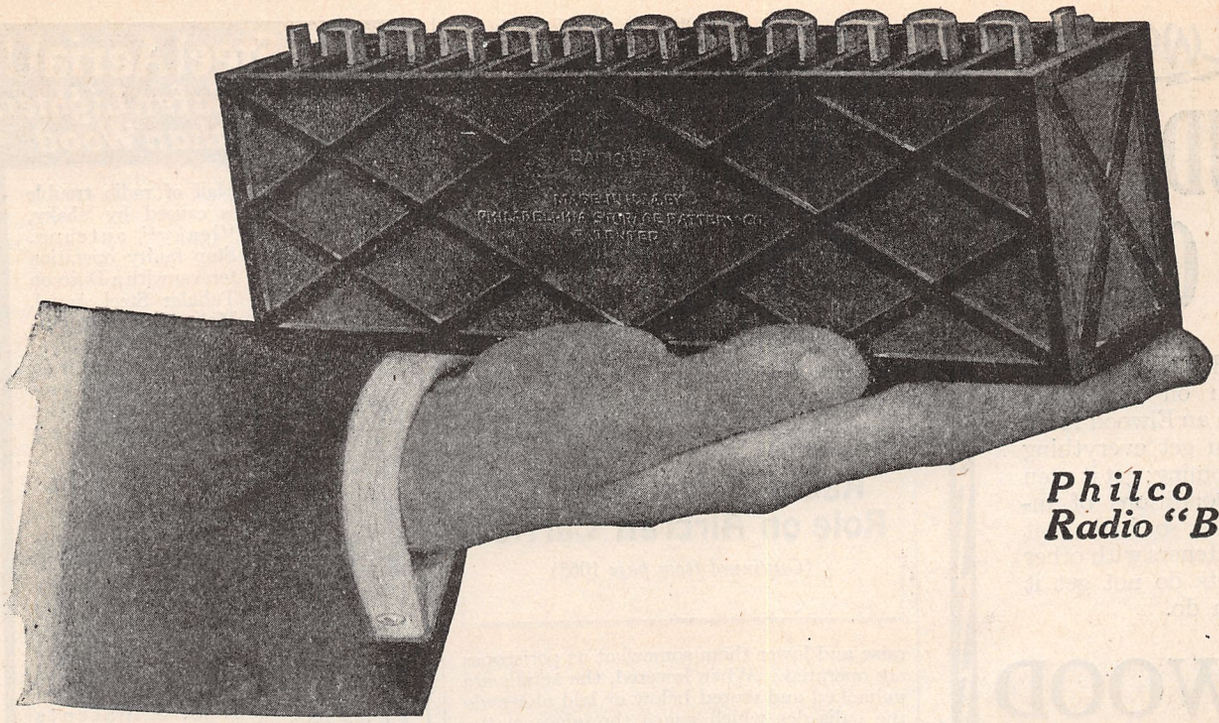
Size	Price
.00025	$0.35
.0005	.35
.001	.40
.002	.40
.0025	.50
.005	.75
.01	1.50

Complete diagram of the Armstrong Super-Regenerative Circuit FREE with every purchase of MICONS.

Sizes .0025 and .005 are especially adapted for the new Armstrong Super-Regenerative Circuit. Micons come in all capacities from .000025 to .01.

At your dealers—otherwise send purchase price and the desired Micons will be sent without further charge.

CHAS. FRESHMAN CO., Inc.
290 Hudson Street New York City



Philco Drynamic Radio "B" Battery

Born the day you get them

The life of a new Philco Drynamic Radio Battery starts when you pour in the Philco Electrolyte—not weeks or months before at the factory. And no initial charging is necessary.

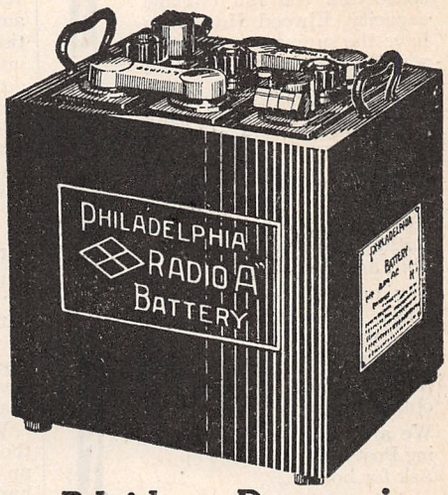
That means you can now get, *for the first time in history,* a charged, 100 per cent new storage battery the day you need it—a revolutionary development in battery engineering.

Philco Drynamic Radio Batteries are CHARGED DRY at the factory. Just add Philco Electrolyte and they're ready for use. No waiting for initial charging. No paying for battery life lost on the dealer's shelf.

What is even more important—Philco Drynamic Batteries, for both "A" and "B" Circuits, give you longer service per charge and last longer than any radio battery ever built. And their uniform current insures absolute freedom from "frying," "cracking" noises.

Why invite the annoyance of frequently tuning in—of having your pleasure spoiled by disturbing noises? Get the best possible results from your radio by installing these wonderful new Philco Drynamic Batteries NOW.

Ask your radio dealer for them or go to the nearest Philadelphia Diamond-Grid Battery Service Station.



Philco Drynamic Radio "A" Battery

RADIO DEALERS—Philco Drynamic Batteries let you into the battery business on a package goods basis. No acid sloppage. No charging equipment. No batteries going bad in stock. Wire or write for details.

Philadelphia Storage Battery Company, Philadelphia.

Makers of the famous Philco Slotted-Retainer Batteries—standard for automobiles, electric passenger cars and trucks, mine locomotives and other high-power, heavy-duty battery services.

PHILCO
DRYNAMIC RADIO BATTERIES

Mail this coupon today

Sirs: I want to know more about the new Philco Drynamic Radio Batteries.

Name.....

Street.....

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ELWOOD

LOUD and CLEAR

WHEN you listen in on the world through an Elwood Head Set, you get everything that's coming; get it even under conditions of interference so bad that other listeners with other head sets do not get it like you do.

ELWOOD HEAD SETS

Have Extreme Sensitivity

With the greatest number of ampere turns within the given space and the full ohmage capacity, Elwood Head Sets have the supreme sensitivity which distinguishes them in the wireless world.

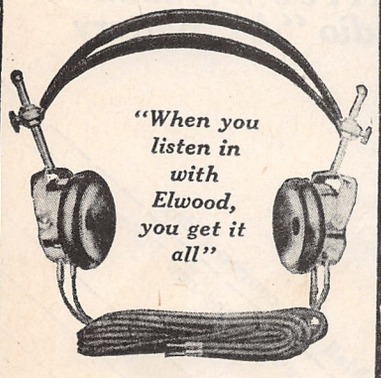
Made in three different types in 2000 ohm sets at $5.50 and 3000 ohm sets at $6.50.

Metal cases; highly-finished head bands; sanitary fabric covering. Easily and comfortably adjustable. Strongly built and durable.

Try an "Elwood." You'll never be wirelessly happy until you're using one.

Order direct from us (at above price delivered) if you cannot obtain from your dealer.

We also manufacture Binding Posts and Contact Points. Ask for booklet.



"When you listen in with Elwood, you get it all"

Elwood Electric Co., Inc.
2-4 RANDALL AVENUE
BRIDGEPORT, CONN.

Miss Hann showed me a telephone booth in one corner of the room which she had cleverly concealed by draperies. Here by an ingenious relay system it is possible for her to hear how the concert being broadcasted in the room sounds at Princeton, N. J.

It is obvious that here is a field of endeavor peculiarly suited to women, and the men will surely have to look to their laurels. Even though most women's voices do not carry as well as most men's, it seems probable that the "talkative sex" will soon make its presence felt in this particular region of the radio world. If they are all chosen with the care which has apparently been exercised in the selection of these two charming pioneers, I am sure that every fan will welcome them.

Radio Plays Important Role on Aircraft Carrier

(*Continued from page* 1065)

raise and lower them somewhat as periscopes are operated. When lowered, the aerials are unhooked and stored below or laid alongside the palisades which guard the edges of the flying deck. The masts are elevated simultaneously after the antenna wires are hooked on. This aerial is the principal one used for long distance communication. Auxiliary antennae are carried aft along both port and starboard sides. These antennae are hung outboard on davits which can be swung in like ordinary boat davits, and housed close to the vessel's side when not in use. Primarily these antennae are used to work nearby land stations and aircraft when aloft, as they do not interfere with the operation of the landing deck. At sea with no aircraft aloft, the vessel uses its mast antenna, but when planes are taking off and landing, the auxiliary side antennae are used, although the masts could be raised for transmitting a message and then lowered.

A RADIO ROOM ELEVATOR

Located below decks is the usual radio room found on all men-of-war, with its equipment for transmitting and receiving, generators, batteries, etc. The day of a radio house on the "top side" of military ships has passed. Today the operator on watch sits below instead of "on top of the world" as on merchantmen and liners.

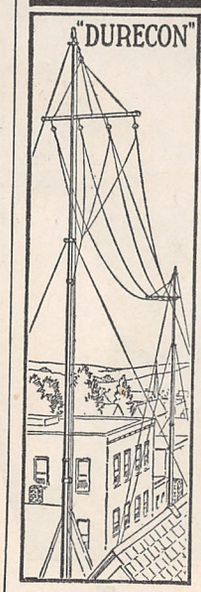
When operating with the radio compass on the *Langley*, however, the radio man comes up on the top deck and brings his house with him. In this very important work, an original idea has been carried out by the Naval constructors; for ascertaining the position of aircraft, ships or shore stations, the radio compass house, built on the lines of an elevator, is run up to the top side, where it projects above the deck like a pilot house. Its operator, the radio man, can raise and lower it at will, and from its location aft on the starboard side he can take bearings without interrupting the operation of plans as they land or depart. The roof of his house when he is "up," forms part of the deck of the flying platform when he is "down."

THE RADIO EQUIPMENT

Below in the radio room the ship has a regulation Naval 2 K. W. spark set for ordinary traffic work, but there is also a 300-watt tube transmitter, consisting of six 50-watt tubes. This set is adaptable for use either as a radio telephone or as a telegraph apparatus with I. C. W. (Interrupted Continuous Wave) or C. W. (Continuous Wave). For communication with the aircraft in the vicinity of the mother ship, either on the sea or in the air, the 300-watt set is used.

Another feature of this unique vessel is the plane elevators which raise and lower planes from the storage hold below and the

An All-Steel Aerial!
Stronger, Safer, Lighter, Cheaper than Wood



Half of radio trouble is caused by shaky, "leaky" antenna. Stop faulty operation forever with a Durecon Tubular Steel Aerial. Make your radio outfit efficient — safe — long-lived. Put it on a par with costly professional sets. Get full enjoyment out of it.

Easy and Quick To Erect

Light in weight—made of special analysis tubular steel. Easily put up—and stays rigid when put. This special steel resists rust and corrosion, All fittings fully covered by U. S. patents pending.

Comes Complete

with masts, guy anchors, plenty of tough galvanized strand wire, clamps, etc. All fittings, connections and bolts are of best quality—suitable accessories to this high grade radio necessity.

Get Yours Now

Avoid delays occasioned by the heavy demand already felt. Order yours now—get fullest benefit from your radio set. Write us today for complete information and prices.

DEALERS!

Write on your business stationery for dealer discounts. Dealers who know a good thing when they see it may be given exclusive distribution and territory rights. But act—another live-wire in your territory will if you don't, because good news spreads fast. Telegraph if you live in a city where radio trade competition is keen. Do one of the two *now!*

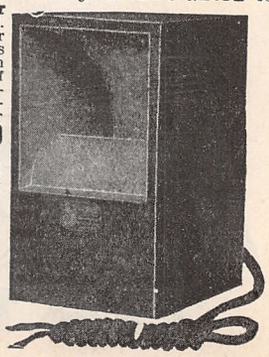
Waukesha Steel Products Co.
Dept. 50, Waukesha, Wis.

Spirola
LOUD SPEAKER
Complete with a Special Unit
POWERFUL BEAUTIFUL
Concert
PATENT PENDING
NATURAL TONE

If you love real music you can't afford to buy till you hear SPIROLA CONCERT. You can hear it at our risk—try it ten days and return if you wish for immediate refund of price. At dealers or prepaid (C. O. D. if preferred) mahogany or dark oak finish, bronzed throat **$12.50**

SPIROLA DELUXE —without unit, using your own headset. Same shape and finish..... **$4.85.**
In black finish **$3.85.**

Folders on Request



L. H. Donnell Mfg. Co.
Dept. A. Box 70
ANN ARBOR, MICHIGAN

Paul F. Godley, designer of Paragon Radio Products, listening in

Godley Warns Radio Operators of Trouble This Winter

Paul F. Godley expects a chaotic situation in radio receiving this winter. Due to the delay in governmental regulation of broadcasting, operators of single circuit receivers are bound to have serious trouble. Mr. Godley says:—

"The coming season will see from ten to twenty times as many broadcasting stations as there were last year, all concentrating on one narrow band of wavelength. With a single circuit receiver, jamming and mixed messages are bound to result. Market reports, election returns, time signals, musical selections—all will be jumbled together in hopeless discord.

"The only way to cope with a situation like this is to use a three circuit regenerative receiver.

"For example, the Paragon three circuit receiver can select between broadcasting stations of about the same signal strength with less than one per cent differential."

The Paragon receiver is easy to operate. It provides a simple solution for an extremely difficult problem.

Don't spoil your programs this winter with an obsolete receiver. You can only expect satisfactory results with an up-to-date receiver like the Paragon.

Also Manufacturers of
PARAGON

- Radio Telephone Transmitters
- V. T. Control Units
- Rheostats
- Potentiometers
- V. T. Sockets
- Amplifier Transformers
- Detectors
- Control Dials
- Amplifiers
- Receivers
- Switches
- Variometers

ADAMS-MORGAN CO., 6 Alvin Ave., Upper Montclair, N. J.

PARAGON

Reg. U. S. Pat. Off.

RADIO PRODUCTS

$7.65 NOW

WAS $10.00

If your elaborate audion tube outfit is not giving satisfactory results, test the head set. Get and compare a TRIMM Professional Head Set and note the big difference.

If, on the other hand, yours is a simple crystal set and gives constant trouble, don't discard it and spend the money for an expensive vacuum tube receiver. Give it a chance to make good by fitting it with a TRIMM Professional Head Set. A second head set on your receiving outfit will enable other members of the household to share your fun and pleasure. Read about the TRIMM Multiphone Connector below.

TRIMM Professional Head Set

3,000 OHMS

Dont judge a head set by its name alone but insist upon proving its quality at the manufacturer's risk. TRIMM Professional phones are not only guaranteed equal to other head sets selling for $10.00 to $15.00 but are sold on five days' trial—your money back if not perfectly satisfied. Moreover, they are positively guaranteed for one year against any defect.

Remember, our new reduced price saves you $2.35. Perfectly matched. Perfect reproduction and articulation at any range.

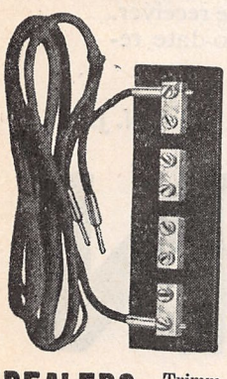
Designed and built by highly skilled experts of long experience.

One-piece magnet, formed (not punched), guarantees uniform tempering and magnetizing. Cases and caps made entirely of high grade Phenol compound, free from sulphur and corrosive gases; odorless and warp-proof. New type head band insures perfect comfort.

Five Days' Free Trial

Mail your order today or buy from your dealer. If you do not find the TRIMM Professional superior to any $10.00 head set, return it and your money will be refunded.

TRIMM MULTI-PHONE Connectors



For connecting 2, 3, 4, or 5 additional head sets to audion tube or crystal detectors. Type "A" (illustrated above) for connecting head sets in series—the only proper method for lamp detector sets. Does not diminish the sound or tone by dividing it between the extra head sets. Type "B" (not illustrated) for connecting head sets in multiple—the only proper method for crystal receiving sets.

Prices:

For 2 head sets...$1.00
For 3 head sets... 1.25
For 4 head sets... 1.50
For 5 head sets... 1.75

DEALERS: Trimm Radio specialties have no real competition. Our wholesale and retail distributors are fully protected. Write for quantity discounts and full particulars. We ship your first order on approval.

TRIMM RADIO MANUFACTURING CO.
Dept. 11, 24-30 S. Clinton St., Chicago

top of the elevators forming part of the ship's deck when they are "down" like the radio house roof. Forward and aft are the catapults for launching the planes, as well as the arresting gear for stopping them when they land. Most of the usual "top side" equipment of an ordinary ship is below the flying deck, such for example as the pilot house, which is well forward, port and starboard jib cranes for lifting sea planes from the water, the four 5" rifles, and deck houses. Her two funnels project from her sides toward the stern, where they may be turned upward, aft or downward to keep the smoke from the upper deck.

Great results are expected from the *Langley*, the first aircraft carrier of the Navy, and many advanced experiments in radio communication with aircraft are planned. The lessons learned in radio and practical aeronautical operation at sea will be incorporated in the new aircraft carriers which the Navy will build out of two battle cruisers scrapped by the Armament Conference.

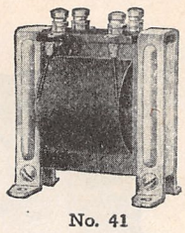
AT LAST THE ANSWER!

Question: Why did the Grid Leak?

Answer: Because Fila. ment 2 MT it but forgot.

—From *Popular Wireless*, London.

"SUPERLATIVE" AMPLIFICATION



No. 41

You Can

Increase Your Range

Eliminate Howling and Distortion

Bring Out the Full Clear Tone in Volume

WITH

JEFFERSON

Amplifying Transformers

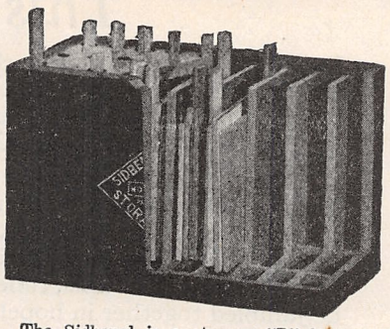
Furnished in two types either mounted or unmounted. Coils specially wound with No. 40 and No. 44 wire on a core of the finest rolled Silicon steel.

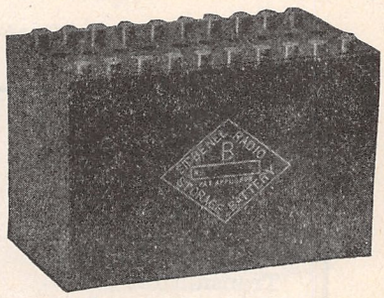
SEND FOR RADIO BULLETIN

Prompt Deliveries

JEFFERSON ELECTRIC MFG. COMPANY
424 S. Green St., CHICAGO

THIS "B" BATTERY WILL LAST 5 YEARS





The Sidbenel is a storage "B" battery that will last five years of constant use without replacing parts. It will give continuous service for at least six months before it becomes necessary for recharging. It can then be recharged in a few hours to its original full capacity, all ready for another six months' use.

The Sidbenel storage "B" is something every radioist needs. Think of the money saved by not using dry "B" batteries which are of no use when they once become discharged. The Sidbenel pays for itself in six months.

It is so ruggedly constructed that rough usage will not harm it. The container is one-piece genuine hard rubber. The battery boxes are made of hard rubber moulded into ten compartments. It comes in one, two, five, eleven and twenty-two units with voltage of 23, 44, 115, 250 and 500, respectively. Size 2½x3x4½ per unit.

Every inch of the Sidbenel storage "B" is constructed under our own patents. The plates are especially treated with a newly-discovered chemical that eliminates howling and screeching so commonly found in dry "B" batteries.

The Sidbenel storage "B" is shipped to you partly assembled. All you need do is to connect the plates together. This takes but ten minutes and is most simple, as instructions are furnished with each battery.

GUARANTEE

A two-year written guarantee is given with each Sidbenel Storage "B" battery. This is your complete protection.

For recharging, we furnish a rectifier for AC current which costs 25 cents extra. DC current requires none.

Order a Sidbenel Storage "B" today by mail and same will be shipped immediately. Money order or check. No stamps.

One unit, 23 volts.....$3.85
Two units, 44 volts..... 7.50
Five units, 115 volts.....$17.50
Eleven units, 250 volts..... 36.50
Twenty-two units, 500 volts.....$65.00

We are the manufacturers and distributors of a high class of radio apparatus bearing the name "Sidbenel." Complete sets ranging from $3.35 to $500. Also a number of knocked down sets which you can assemble yourself at a big saving in money to you.

FREE Send today for our complete catalog showing our apparatus—it's free. This catalog contains items at unheard-of low prices. It will be the means of saving you considerable money. Send for it at once.

Sidbenel
RADIO EQUIPMENT MFG. CO

SIDBENEL RADIO EQUIPMENT MANUFACTURING COMPANY
1663 Jerome Avenue .·. New York City
The Largest Radio Mail Order House in the World

The SANDMAN'S STORY

Catalog Number Four contains Marvelous article on tuning Receiving Sets. 10 cents brings it to you

On a Tuska Radio Receiver, every evening you can hear "The Sandman's Story". This delights the children. Later comes entertaining Radio Broadcasting for grown-ups.

Tuska Radio will bring dependable broadcasting into your home. A Tuska Radio Receiver makes a wonderful Christmas Present.

Tuska Radio is substantial, reliable, dependable and recognized. Inspect today at your dealer's.

THE C. D. TUSKA COMPANY

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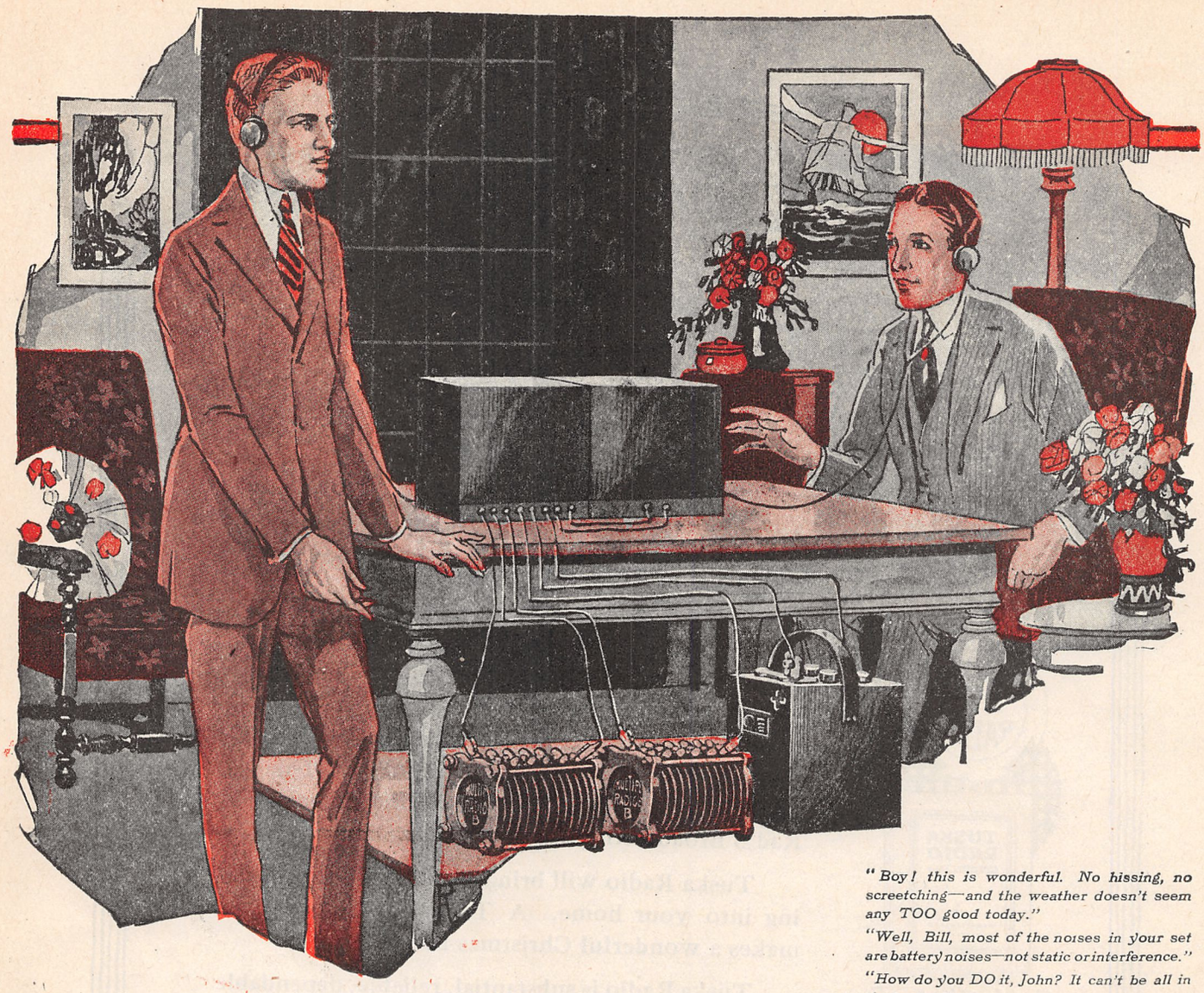
TUSKA RADIO

Established 1911

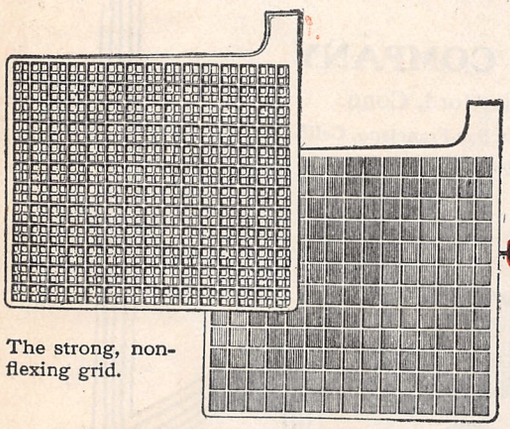


"Boy! this is wonderful. No hissing, no screetching—and the weather doesn't seem any TOO good today."

"Well, Bill, most of the noises in your set are battery noises—not static or interference."

"How do you DO it, John? It can't be all in the tuning."

"It isn't in the tuning at all. It's Radiobats "A" and "B". Try 'em and HEAR"!

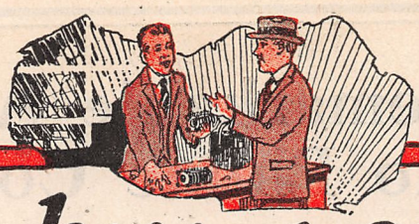


The strong, non-flexing grid.

The plate with the least exposed metal area.

The secret of rugged strength is in the exclusive Radiobat Grid

RAD "A" and "B"



How do you buy your radio batteries?

DO YOU SAY to a jeweler, "I want a watch!"—or do you ask for a specific watch which does well what watches *must* do *well?*

And so with batteries for radio.

Most of the noises attributed to static and other causes are *battery* noises. They are caused by irregular current discharge—"fluctuating" voltage.

Have you ever noticed how electric lights *flicker* in some localities—enough to make reading impossible?

Just so, ordinary batteries send out *fluctuating* currents, which make *hearing flicker!*

Radiobats "A" and "B" give absolutely *steady* voltage. They eliminate "interference" because they never produce it. They virtually cut out "static" because *they* don't produce sounds *like* static.

George Gaynor Hyde, one of the foremost consulting engineers in Radio reports, "..... total absence of any noises such as are common to the usual type of "B" batteries. In fact when the antenna wire was removed from the set, it was almost impossible to tell whether the remaining apparatus was working or not."

With Radiobats "A" and "B" one adjustment lasts *all* evening; screeches and screams become splendid harmony; hisses become the most enjoyable music; grating, rasping gasps become clear, melodious human voices.

Leakproof and Economical

Radiobats "A" and "B" *cannot* leak. They contain *no* liquid. They have the only *solid* electrolyte—which makes them far safer and cleaner than any other batteries.

And they are economical. For Radiobats "B" are also, in reality, small storage batteries which can easily be recharged *at home overnight.*

On each charge they have the capacity of ten radio dry cells. They need *never* be replaced. They cannot get out of order. And their general design and construction provide the faultless current production which gives this remarkable radio reception.

Until you have heard a set with Radiobats "A" and "B" hooked in, you have *never* heard *real* radio, no matter how deeply you have progressed into this marvellous science.

Send for our intensely instructive booklet—free—and send us the name and address of your dealer, so that he may give you the finest radio demonstration you have ever heard. Send for it now.

Multiple Storage Battery Corporation 350 Madison Avenue, New York

IOBATS

The Permanent Radio Power-UNIT

A Remarkable Advance In Radio Phone Construction

Myers' Radio Phone

(3000 Ohms)

New materials, new genius of design, and new standards of precise workmanship made possible this achievement in radio receiving.

With the Myers' Radio Phone you hear more clearly, more evenly, and from greater distances. With this phone only can you derive maximum pleasure and permanent satisfaction from your radio set.

A feature is the shell and cap, which are made of a special strong bone-dry material, finished in deep mahogany, beautiful in appearance and shaped to reproduce clear voice and music. There are no openings into the receivers. This prevents entry of moisture, air or dust, maintaining the tuning quality of the phone under different atmospheric conditions.

The headbands are of phosphor bronze, heavily plated, covered with soft rubber, sanitary, comfortable, pliable, quickly adjusted and easily detached.

Every detail of this remarkable product, even some of the materials of which it is made, is covered by patents pending. Yet the Myers' Radio Phone retails at $10.50, one-third less than other high-grade phones.

The Insured Head Set

Every Myers' Radio Phone is guaranteed unconditionally as to tone, quality of material, and workmanship.

GUARANTEE: This Myers' Radio Phone was carefully inspected, adjusted, and tested before leaving our factory and should be in perfect working order. If, however, it is found imperfect in workmanship, material, tone, or otherwise unsatisfactory, return it direct to us parcel post, charges prepaid. We will replace all imperfect parts free of charge, returning to you a perfect instrument, charges prepaid.

Not every radio fan can have a Myers' Radio Phone, because the standards of precise workmanship permit only a limited production of these fine, artistic, craftsmen-built phones. Order yours now from your dealer. If unable to obtain through him, mail order direct to us.

Distributors, jobbers, and dealers write for our special proposition. Descriptive circular sent on request.

Radio Appliance Mfg. Co.
6282 Beaubien Street
Detroit Michigan

PLEASE NOTE

Our Christmas Magazine Offer on pages 1246-1247 of this issue.

What better or more appropriate gift than your favorite magazines?

A very welcome reminder of the giver twelve times in the year.

You can make your own selection from this list.

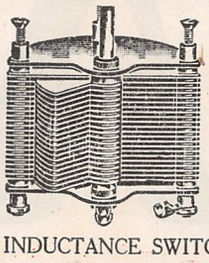
You can also renew your own subscriptions—no matter when they expire—we will have them extended the proper time.

Remember, we will enclose Christmas cards in your name if desired.

Do not wait for the last minute rush—but send your list today.

EXPERIMENTER PUBLISHING CO., Inc.
53 Park Place, New York

"SAMCO" RADIO PRODUCTS OF QUALITY



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11-23-43-63 Plates
RHEOSTATS
POTENTIOMETERS

INDUCTANCE SWITCHES
VERNIER ATTACHMENTS

Special Proposition to Dealers and Distributors

Standard Appliance Mfg. Corp.
434 East 71st Street New York City

New York Police Install Broadcasting Station

(*Continued from page* 1065)

with the transmission of radio telephonic information it is very likely that we may even use the ether to spread confidential reports. It would not be very difficult to prepare a special code for such purposes."

M. R. Brennan, Superintendent of the Police Telegraph Division, who with Commissioner Enright himself was mainly influential in clearing the way for the installation of the station, explained some of the radio telephony plans of the local Department. "We have already arranged with Mr. Hoover, Secretary of Commerce, for a special wave-length for exclusive police purposes," he said. "The fact that there can be no delay in the dissemination of police news makes it out of the question for us to take any chances of being interfered with by the commercial broadcasting stations. Mr. Hoover, who recalled how the New York department was the first to make a success of radio telegraphy for police work some years ago, has been quick to realize our position and has authorized us to send on a 400 meter wave-length. Later if it becomes necessary for the Department of Commerce to allow wider scope to any of the present users of the 360 meter wave length, it has been agreed that we will widen our range to 500 meters.

"We have already made arrangements," Mr. Brennan continued, "to equip our police boats and inspection district offices with radio telephonic receiving sets. As we progress with the idea, receiving stations will be installed in all precinct headquarters and special operators will be detailed to attend them twenty-four hours a day. When the other larger cities take to radio telephony for administrative purposes, we expect to be able to establish a network of broadcasting and receiving stations that will make it possible to give a national alarm almost instantaneously.

"Determined that the best was none too good for our purposes, Commissioner Enright made arrangements with the Western Electric Company for a station of the most up-to-date type."

WHAZ—Largest College Broadcasting Station

(*Continued from page* 1058)

TRANSMITTER WEIGHS A TON

The radio transmitter, which forms the heart of the Rensselaer Polytechnic Institute broadcasting station, is contained in a large black steel cabinet weighing a ton, in which are installed the vacuum tubes, filters, relays, resistances and other auxiliary apparatus. The antenna relay is mounted on top of this framework. Four 250-watt vacuum tubes and one 50-watt tube are used for transmitting. A filament current of 6.25 amperes is supplied from a constant potential generator. The frequency of the transmitted energy (wave-length) is controlled by the value of the inductance in the oscillatory system which includes the antenna. This inductance is adjusted by means of a variometer. The movable coil also serves to vary the coupling between the antenna circuit and that portion of the coil system which is connected to the plates and grids of the oscillator tubes. A variable condenser connected across the plate coil controls the plate current through the oscillator tubes.

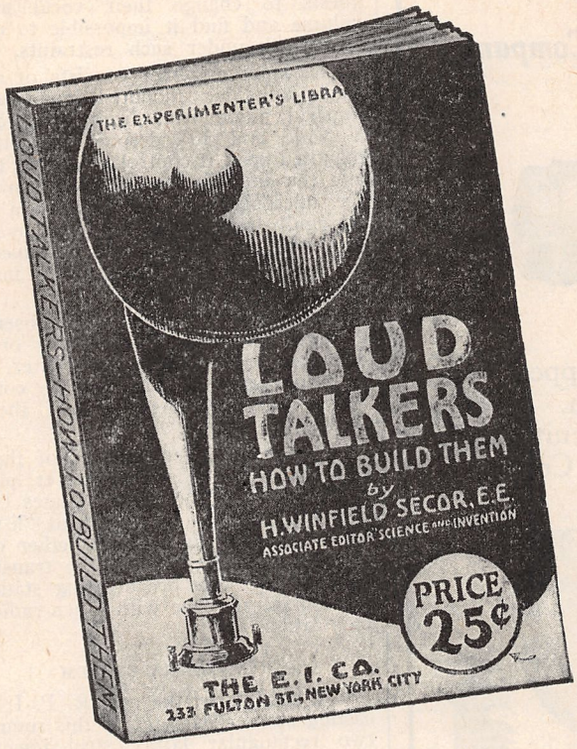
INPUT EQUIPMENT

The input equipment consists of microphones, input amplifier, control apparatus,

Get This Wonderful New Book About

LOUD - TALKERS

HOW TO BUILD THEM



by H. WINFIELD SECOR

Associate Editor of Science & Invention

25 cents, postpaid

This book describes how to build two distinct and different types of radio loud-talkers, which can be built with either electro-magnetic field to be excited from storage battery, as well as permanent magnet field requiring no separate battery excitation. The third chapter deals with improvised loud-talkers and gives clear and complete instructions on how to build suitable horns for use with radio receivers of the Baldwin and other types. Several elaborate hook-ups are given of the author's own radio receiving set, comprising one stage of radio-frequency, detector and three stages of audio-frequency amplification, together with all the connections for the loud-talker.

Complete data is given for all the parts of the loud-talkers, including the field magnet windings, as well as the diaphragm or moving coil windings, and also the step-down transformer to be connected between the vacuum tube amplifier and the loud-talker proper.

In preparing these designs the point has been constantly kept in mind to use the simplest parts possible, so that practically anyone can build a successful loud-talker equivalent to the commercial types costing $40.00 or more.

Even where the experimenter does not possess the skill or the time to make all the parts himself, which are really few in number, he may save a great deal of money, or at least half the price of a commercial loud-talker, by having the difficult parts made in a local machine shop, and then assembling them and winding the coils himself. Circuit connections and data for the size of wire, etc., are given for placing the loud-talker on a separate floor or in another part of the house not occupied by the radio receiving set. A very valuable book, giving data which cannot be obtained anywhere else and which has not been published before.

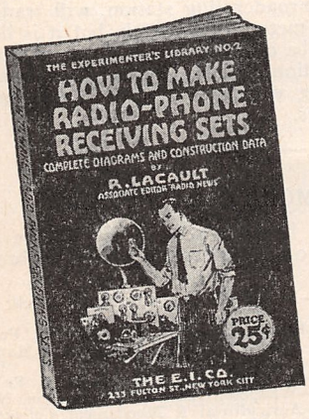
64 pages, 25 illustrations, bound in beautiful two-color cover, size 5½ x 7½ inches; Price prepaid, 25 cents

Have You a Copy of These Two Books?

HOW TO MAKE A RADIO-PHONE RECEIVING SET

25¢

By ROBERT E. LACAULT
Associate Editor RADIO NEWS



A non-technical book for the beginner. Gives complete constructional data on the building of a complete Crystal Detector Set, Tuning Coil, Loose Coupler and a Single Audion Tube Set with Amplifying Units. It furnishes all dimensions and working drawings of every part that must be constructed by the amateur. Written in plain, simple language that anyone can understand. The opening chapter gives a complete description of the theory of radio and tells what it's all about, teaching the principles of wireless so that the constructor knows what he is doing.

48 Pages, 26 Illustrations
Bound in Beautiful Two-Color Cover
Size, 5½x7½ inches. Prepaid 25c.

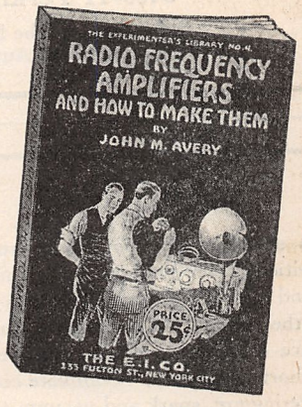
RADIO FREQUENCY AMPLIFIERS AND HOW TO MAKE THEM

25¢

By JOHN M. AVERY

This book is for the more advanced amateur, showing the construction of the Radio Frequency Amplifying Transformer and giving complete constructional data. It shows the application of Radio Frequency to amplifying units that the amateur may already possess and gives 15 hook-ups showing practically every use Radio Frequency Amplifying Transformers can be put to.

32 Pages, 15 Illustrations
Bound in Beautiful Two-Color Cover
Size, 5½x7½ inches. Prepaid, 25c.



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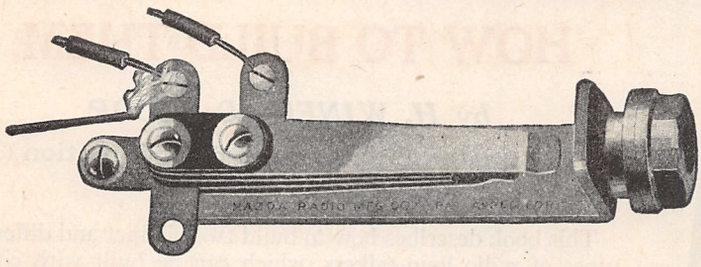
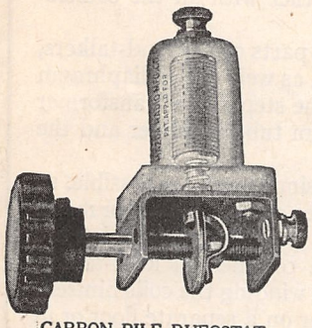
SOME OF THE { *NEW* / *ORIGINAL* / and *BETTER*

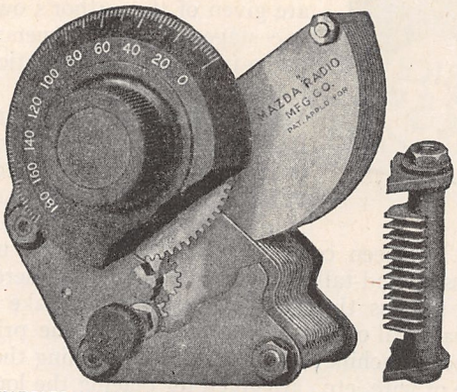
Products of The Mazda Radio Manufacturing Company



Jacks.—Ears designed for accessibility and equipped with screw, nut and fusible washer. Solder with a match. Prices: Open Circuit **$.70**, Single Circuit **$.85**, Double Circuit **$1.00**, Filament Control—Single Circuit **$1.00**, Filament Control—Double Circuit **$1.20.**



CARBON PILE RHEOSTAT
Price: $1.75



VARIABLE CONDENSER. Prices: 3 Plate $3.00, 23 Plate $5.50, 43 Plate $7.00.

The above articles are only a few of those being marketed, all of which contain unusual features, provide for accessibility, ease of assembly, and are correct in their electrical and mechanical design. We manufacture everything for the radio fan except tubes and batteries, each article being produced and tested in several styles and sizes, and sold at prices surprisingly low for the high quality of our product.

The Mazda Radio Manufacturing Company

3405-11 Perkins Ave., CLEVELAND, OHIO

Subsidiary of The Simmons Mfg. Co., Largest Independent Manufacturers of Automobile Replacement Parts in the World.

RADIO JOBS

All students of this school receive positions after graduation. The demand for men is greatest at this time of the year. On account of limited space enrollments can be accepted for a short time only. Complete courses covering arc, spark and vacuum tubes, also radio telephony.

Send for Free Illustrated Booklet

Y. M. C. A. RADIO SCHOOL
158 East 86th St. New York City
"The Best Radio School in the East"

ALL RADIO AMATEURS USE

25c
Patented Oct. 3, 1911 Per Tube

Most Wonderful Solder Ever Invented
SOLDERS WIRES
SOLDERS RADIO CONNECTIONS
SOLDERS POTS AND PANS
SOLDERS ALL METALS
Put up in Paste Form in Collapsible Tube Ready for Instant Use.
GUARANTEE: We guarantee that the work resulting from the use of Solderall is equal to that from wire or bar solder.
Sold by All Up-to-Date Stores or Sent by Us Post Paid

SOLDERALL CO., Dept. R
129 Sussex Avenue NEWARK, N. J.

batteries and a loud speaking receiver for monitoring purpose. A new feature of the equipment permits the regulation by the monitor of the volume of sound of voice or instrument at this cabinet without the knowledge of the person whose productions are being broadcast. Frequently it is found that artists are sensitive to requests to change their vocal pitch or volume and find it impossible to do their best work under such restraints.

The input amplifier consists of a three-stage amplifier mounted upon a black finished angle iron framework, 5′ high, 2′ wide and 10″ deep. The panel has mounted upon it control apparatus to regulate the amplification. Current to operate the microphone is supplied by a 12-volt storage battery and is regulated by a rheostat. Filament current is obtained from the same battery. Provision is made for recharging this battery.

To enable the operator to observe the loudness and quality of speech or music delivered to the radio transmitter, a loud speaking receiver with horn is connected across the input terminals of the radio transmitter.

One of the other features of the radio room is No. 2-C radio receiver, provided to comply with the United States Government regulations in regard to "listening" at intervals to determine whether distress signals are being sent or the transmitting operations of the broadcasting station are causing interference with other radio communications.

ANTENNA SYSTEM

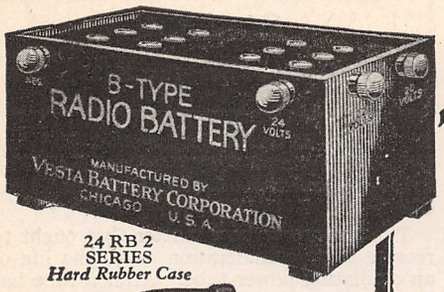
The antenna of the new R. P. I. broadcasting station was erected this summer on two rectangular lattice steel towers, 80′ high, securely riveted to the roof girders of the Sage Laboratory. The antenna is of the T-type, consisting of four horizontal wires, each 125′ long and spaced 6′ apart. The construction used is not of the rigid type, but is so arranged that the antenna may be raised or lowered for experimental purposes. The insulated guy ropes are so arranged as to hold the antenna in a rigid position. The erection of the antenna poles on top of the 65′ building raises the wires about 145′ above the ground. The Institute campus being located at the crest of the slope overlooking the Hudson Valley and the city of Troy, and the Sage Laboratory being approximately 500′ above tide-water level in the Hudson River at Troy, the elevated location of the antenna is regarded as particularly advantageous in relation to the contour of the surrounding country.

For the present station WHAZ, the R. P. I. broadcasting station, will transmit on a 360-meter wave-length, but it is likely this will be changed under the new system of apportioning the field of broadcasting now being worked out by the government authorities.

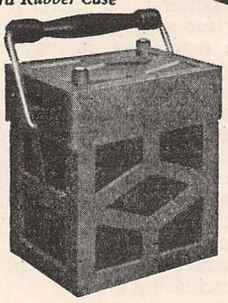
MORE BROADCASTERS

Twelve licenses were issued by the Department of Commerce to 360 meter broadcasters.

WMAY—Kingshighway, Presby. Church, St. Louis, Mo.
WNAT—Lennig Bros. Co., Philadelphia, Pa.
WNAH—Manhattan Radio Supply Co., Manhattan, Kansas.
WOAV—Penn. National Guard, Erie, Pa.
WMAW—Whapeton Elect. Co., Whapeton, N. D.
WTAW—Agricultural & Mechanical College of Texas, College Station, Texas.
WPAA—Anderson & Webster Elect. Co., Waco, Nebr.
WNAJ—Benson Co., Chicago, Ill.
WMAN—Broad St. Baptist Church, Columbus, Ohio.
KFBV—Clarence O. Ford, Colorado Springs, Colo.
WMAX—K. & K. Radio Supply Co., Ann Arbor, Mich.
WSAV—Clifford W. Vick, Radio Construction Co., Houston, Texas.

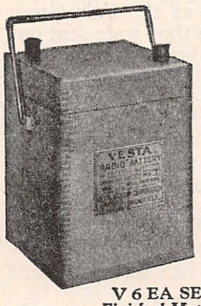


24 RB 2
SERIES
Hard Rubber Case



R 6 EA SERIES
Hard Rubber Case

6 EA SERIES
Black Wood Case



V 6 EA SERIES
Finished Maple Case

PRICES

No.	Amp. Hrs.	Prices
6 EA 5	60	$17.50
6 EA 7	80	20.00
6 EA 9	100	23.00
V 6 EA 7	80	21.50
R 6 EA 9	100	28.00

Vesta six-volt Radio Batteries are made in three styles and three sizes. The ampere draw of a vacuum tube is approximately one ampere—24 RB 2, "B" type, $9.00.

Any Radio Set Is a Better Set With Vesta Batteries

The name Vesta on your radio battery is absolute assurance of long, dependable service, free from the vexations of having the current output drop at the critical moment.

No need to run back and forth constantly to the service station for recharging with Vesta "A" storage batteries. The extra heavy plates retain their charge over long periods.

Vesta "B" Batteries eliminate the "frying" noises made by dry cells (sometimes mistaken for static) and greatly increase the audio efficiency of your tubes. Moreover, an accidental "short" will not put them out of commission permanently, because they can be recharged. This is not possible in the case of a dry battery. Those using the "soft" type of detector tube prefer Vesta "B" Batteries to all other makes.

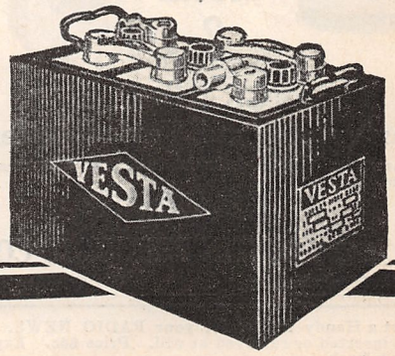
Vesta Radio Batteries are made in the styles illustrated. Two or four years' service may be expected from these batteries if kept watered and recharged when gravity falls below 1200°.

Vesta Service Stations catering to the automobile trade and radio dealers are supplying these batteries. Consult your phone book or write us if you are unable to find a local Vesta dealer.

VESTA BATTERY CORPORATION
2100 Indiana Avenue, CHICAGO, ILL.

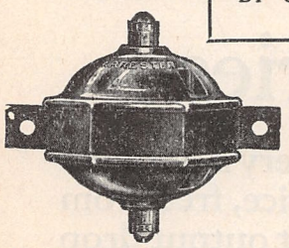
VESTA

COSTS LESS PER MONTH OF SERVICE



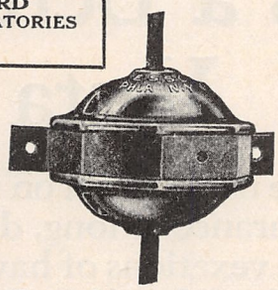
KEYSTONE Lightning Arresters

LISTED AS STANDARD BY UNDERWRITERS' LABORATORIES
(No. 362A-4)



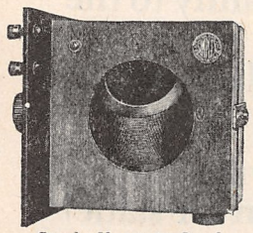
Type B, Arrester. Price, $2.00

After you install a Keystone Radio Arrester you will have highly efficient lightning protection for years. They last indefinitely because they have no vacuum to lose nor fuses to blow. They are enclosed in heavy porcelain, sealed and tested. Install them outdoors where an arrester belongs. You do not need a lightning switch. Write for circular and instructions free. Sold everywhere or sent postpaid on receipt of $2.00.



Type A, Arrester. Price, $2.00

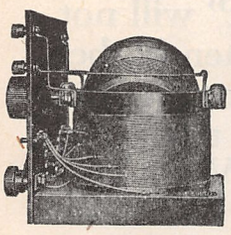
SIMPLEX PANEL UNITS



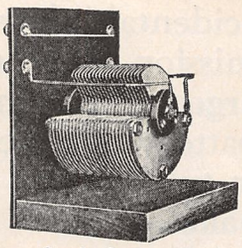
Simplex Variometer Panel

Simplex Panel Units make it possible to try-out many different hook-ups and thus determine the best for a certain locality without disassembling the different panels. This is a decided advantage but of no less interest is the fact that the beginner can first purchase one vario-coupler panel and one detector panel and have a fairly good receiving set at minimum cost with the advantage of later adding additional units to obtain greater sensitiveness and selectivity. Thus, you can continually add to your Simplex outfit and when you have it complete it is unquestionably one of the most attractive and efficient receiving sets now offered to the public

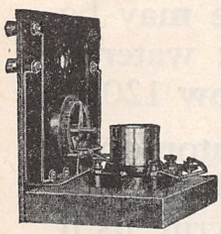
Variometers and vario-couplers are also supplied, unmounted. For Sale by Dealers everywhere, write for circular.



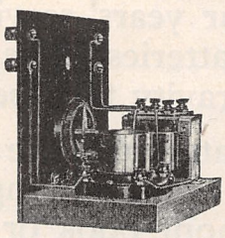
Simplex Vario-Coupler Panel



Simplex Condenser Panel



Simplex Detector Panel



Simplex Amplifier Panel

Electric Service Supplies Co.

Manufacturers of Lightning Arresters for 30 years

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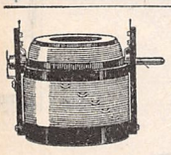
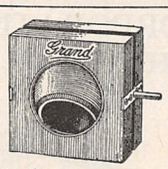
50 Church Street New York, N. Y.

Distributors for Simplex Radio Co.



WHY PAY MORE ?



When You Can Get the

"GRAND"

Variometer and Variocoupler

Guaranteed to stand the highest test, or money refunded, for

$3.00 EACH

Send money order to **AUSTIN PRODUCTS CO.**

319 S. Desplaines St. CHICAGO, Ill.

States Radio Corporation

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STATES RADIO CORPORATION CHICAGO

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STATES RADIO CORPORATION CHICAGO

Get a Handy Binder for your RADIO NEWS. Holds and preserves six issues, each of which can be inserted or removed at will. Price 65c. Experimenter Pub. Co., Inc., Book Dept., 53 Park Place, New York.

Canadian Broadcasting Stations

(*Continued from page* 1059)

needed no further adjustments. The sets were to operate on the wave-lengths allotted by the Dominion Radio Department at Ottawa.

There seems to be a matter that ought to receive some consideration as to the life of an oscillating power tube. After a tube has been working for a very long time on constant voltage regulation, it may vary unevenly in its filament emission, and unless there is an individual space current meter in each plate of the parallel power tubes, there is likely to be one of the group that will deteriorate much faster than the others. If this is the case what must the adjustment be? Will the constant current method of variation be the wisest thing to do? This is a problem that will confront any engineer when the apparatus is working with parallel tubes in the oscillating system.

An example of successful control of parallel power oscillating tubes was shown when the equipment of the Toronto *Daily Star* was operated for eight hours without stop, for two weeks steadily, without change of a single power tube. The radiation was from 6 amperes when starting up, and down to 5.7 when stopping at the end of the eight hour run. No trouble was experienced from the high voltage supply which was in operation within a vault without any ventilation at all.

Each day during the Canadian National Exhibition, addresses were transmitted from this station, which were relayed over the Bell Telephone lines to the speech amplifier, and then radiated. No difficulty was experienced in relaying the speeches from the luncheon table at the Fair Grounds to the radio set, where they were sent out broadcast to the surrounding towns.

Fig. 1 shows the type of radio telephone broadcasting equipment installed in the different stations in Canada. Four ½ K. W. power tubes as oscillators and two ¼ K. W. tubes as modulators.

Fig. 2 shows the towers at the top of the Toronto *Daily Star* building. The two towers are 80 feet in height and 170 feet apart.

Fig. 3 is the *Star* Radio Car making use of Mauborgne Hill compact wave coil antenna and used to entertain audiences in the different cities within a radius of one hundred miles of Toronto. Only the capacity of the car acts as a counterpoise.

Fig. 4 shows the towers and antenna on the roof of the Manitoba *Free Press*, Winnipeg, Man., and are 85 feet in height and 100 feet apart.

The first station in Western Canada is the Manitoba *Free Press* which broadcasts every afternoon and evening, on a wave-length of 410 meters. News from the latest bulletins of the world are sent out regularly and very select musical numbers are broadcasted every night. The country around Winnipeg is flat and very little rolling to the vast expanse of farming land. For a distance of 600 miles to the north the land is almost level. Tremendous distances are covered over this kind of country.

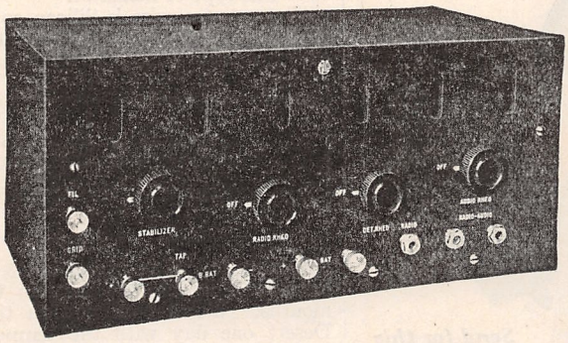
The next station is Regina. It is operated by the *Leader*, a morning paper, and has a large circulation throughout the country. It too is a very flat country, even more so than Winnipeg. The distances covered by the

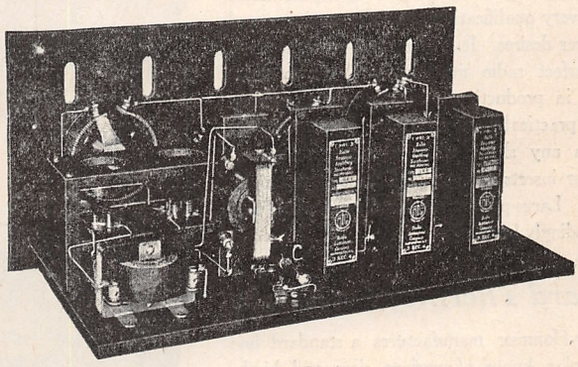
THE J M-6

PRICE $130.00

Radio-Audio Detector Amplifier

Still maintains its reputation of being the most sensitive and dependable receiving instrument on the market.

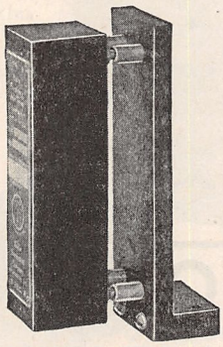




This Instrument Is Ideal for Indoor Coil Aerial Reception

THE DX RADIO FREQUENCY TRANSFORMER

Is the "Heart" of the JM-6. The remarkable results obtained with the Dx R F Transformer throughout the country, is evidenced by the hearty response from amateurs, dealers, jobbers and manufacturers.



PATENTS PENDING

Gives absolute assurance of its superior quality and dependability. One amateur station is hearing broadcasting stations in *Sixteen States* and *Hawaii* by using three stages of Dx R F Transformer.

Wave-length Range

Dx-1, 170-450	**$8.00**
Dx-5, 400-1200	**8.00**
Dx-2, 900-3000	**8.00**
Standard Plug Mounting	**1.00**

Write for Bulletin No. 12.
Curves and Data on Coil.
Aerials, 50 cents.
All prices F. O. B. factory.

"IT PAYS TO HAVE THE BEST"

RADIO INSTRUMENT COMPANY, INC.
TRADE MARK REG.
WASHINGTON, D. C.

C-H THERMOPLAX
COLD MOULDED

For Speed and Economy In Building Quality Radio Parts

C-H Thermoplax the *only* Thermoplax made, embodies every qualification the radio engineer and manufacturer desires. It is electrically and mechanically a perfect radio material, and effects great economies in production. In some cases assembly costs are practically eliminated. Parts may be moulded in any shape with ratings, trademarks, directions or inserts incorporated during the moulding process. Large production per die is possible with a correspondingly low cost.

Standard Thermoplax Knobs

Cutler-Hammer manufactures a standard line of Thermoplax knobs of various sizes and kinds. Prices may be had on application.

In the designing of radio parts, C-H sales engineers in all principal cities are ready to assist. Three sources of supply, New York, Milwaukee and Toronto, insure rapid production free from delays.

The Cutler-Hammer Mfg. Co.

Works: Milwaukee and New York — Offices and Agents in Principal Cities

Associated Canadian Plant: ELECTROPLAX CO., Toronto

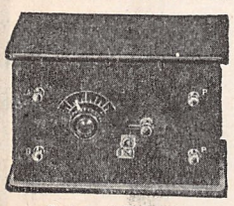
Send for this Booklet

Descriptions and illustrations of various parts including a standard line of knobs.

C-H THERMO[illegible]
COLD MOULDED

If it isn't Cutler-Hammer it isn't Thermoplax

"SUPERIOR" RECEIVING SET



$4.75

In Cabinet Complete as Shown

Guaranteed to bring in signals as loud or louder than any other crystal set made, regardless of price. We will prove this to your satisfaction or refund your money.

Parts for "SUPERIOR" set ready for assembling $3.25
Vacuum Tube Detector Unit $5.50. Unassembled $3.90
Detector and Two Stage Amplifier $22.50. Unassembled $16.80
2000 Ohm Headset $5.00; 3000 Ohm $6.50; 1000 Ohm Phones $1.75

Catalog free at your dealers or

Steinmetz Wireless Mfg. Co. 5706 Penna. Ave. Dept. B Pittsburgh, Pa.

ARE YOU WISE?

To our low prices on all standard radio supplies:

Clapp-Eastham HR Sets	$ 33.00
" " HZ "	33.00
Westinghouse RC Sets	112.50
" Senior Sets	50.00
" Junior "	20.00
Baldwin phones	14.00
Variometers and variocouplers	3.00
Thordarson amplifying trans.	3.95
Brach lightning arresters	1.90
UV-200 Radiotrons	4.50
UV-201 "	6.00
Homechargers	16.00
Fada Rheostats	.75
Murdock Phones 10%	Discount
R-3 Magnavox	40.00

Terms: Cash with order—add postage

Let us know your needs and we will save you money

MUTUAL RADIO SALES COMPANY
WILMINGTON Box 252A DELAWARE

HAVE YOU SOMETHING TO SELL OR EXCHANGE?
A classified ad in Radio News will reach over 235,000 at a cost of only 15 cents a word

Regina station are very great. The distance that this station covers is about 600 miles in the daytime, and is picked up very strong on the Pacific Coast at night time.

Calgary has the broadcaster on the roof of the Calgary *Herald* building. This country is on the extreme edge of the plains in Western Canada; 45 miles west of Calgary is the famous Banff Hot Springs, which is the beginning of the Canadian Rockies. In spite of this mountainous country, Calgary radio broadcasting is heard in the towns along the Pacific Coast very strongly.

Both Calgary and Regina broadcast every day. Calgary in the afternoon until 9 p. m., and Regina only in the evening, although during the winter months their schedule may be changed. Calgary wave length is 430 meters and Regina is 420 meters.

The radiation and over-all resistance of the antenna at Toronto is about 12 ohms, at Winnipeg 10, and at Regina the same. At Calgary it is 9 ohms. The efficiency average from plate input to radiation power is 65 per cent.

Heavy 24-inch Hopewell insulators make up the antenna insulation. Heavy rails make but little difference in the radiation with this type of insulator.

The antenna wire is Silicon copper and is of seven strands of No. 18. All antennae have six wires except Calgary, which has five.

Radio on the Run

(*Continued from page* 1061)

terminate it. We've been in 43 States and have been under four flags in the last 23 months. We've been out on the Mohave Desert one day with the temperature 132 and the next day we've been snowbound at Flagstaff, Ariz., in 7′ of snow. And in the month of May, too.

"We've recruited, worked for various drives—Liberty Loan, Salvation Army and others. We've had a calliope to help us in this work. But for our own amusement and to ward off boredom, as the large silver horseshoe on the front of our radiator wards off bad luck, we now have the Dashboard Special, a set especially designed for use on an automobile. We have been testing it out the las few days and we are very pleased with t. Last night we heard Atlanta, Ga., about 800 miles away—on a loop aerial, too. You see I'm becoming quite technical already but this set is really so simple to operate that I know we will have no trouble with it. Of course, we received all the broadcasting stations round New York quite loudly, even in the downtown districts and I know enough about radio to realize that the high buildings of that neighborhood do something or other to the radio waves to make reception difficult.

"Well, good-bye," concluded Mrs. Davenport, "the crowd's becoming too thick. We'd better be off."

I-Want-To-Know

(*Continued from page* 1098)

A. 1. The circuit you request is shown on these pages. All constants are given. When properly adjusted, the emitted wave is modulated and may be heard on a non-oscillating receiver.

COMBINATION R.F.-A.F. RECEIVER

(559) Mr. Rigby, of New York, wishes to know:

Q. 1. Is there a circuit utilizing four vacuum tubes in which one or more of the tubes are used both as audio and radio frequency amplifiers?

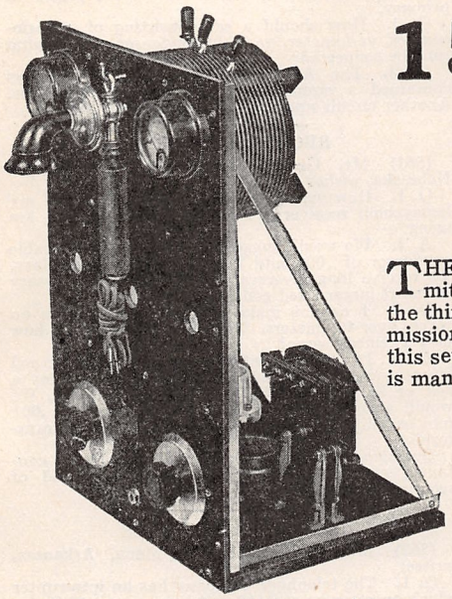
A. 1. Yes. There are several circuits of this character.

Q. 2. If such a circuit is feasible, will you please publish same?

A. 2. A suitable diagram appears on these pages. It would be well to employ amplifying tubes throughout. They should have a low internal capacity.

The BENWOOD RADIO Co. INC.

"WORLD-WIDE MAIL ORDER SERVICE"



The *Benwood* C W Transmitter

Licensed under Armstrong U. S. Patent No. 1,113,149 and pending letters of patent No. 807,388.

*Simple, compact, up-to-the-minute construction—incorporating all the improvements made possible by our years of experimenting—**and it gets results!***

1500 Miles With CW!

1100 Miles Voice!

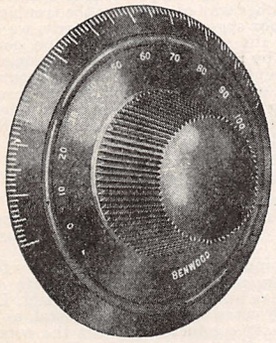
Music Heard 40 Feet From Phones By Stations In 300 to 400 Mile Radius

THESE are actual results obtained by our testing station WEB, using the Benwood CW Transmitter shown herewith. You can get just as good results with it. This high-class set is just the thing for your broadcasting and DX work — using CW, ICW, Modulated Buzzer or Voice Transmission. An ideal set for the local radio club or the more progressive amateur. Think of the range this set will give you! If centrally located, you will be heard in almost every state in the Union. It is manufactured exclusively by and for the Benwood Co. and combines the best in material, workmanship and design.

Radiates 1½ to 3 Amps. on Average Antenna

We guarantee that this outfit will radiate 1½ amperes on the average amateur antenna. It will radiate 2 to 3 amperes when used with an antenna whose fundamental wave length is 225 to 275 meters. That is why you can get such wonderful results.

The set comes to you completely assembled with all parts mounted on panel, as shown, and completely wired. You can start sending as soon as you insert tubes and attach to antenna and ground. The outfit is complete with motor generator minus tubes, and consists of the following: Panel 12x18x3/16, angle supports, hardwood base, 3 tube sockets, 1 power rheostat, one 80-watt filament trans., 1 modulation trans., 1 CW inductance, 1 hand transmitter, one 0-3 Radiation meter, one 0-500 milliammeter, one 21-plate condenser, one 43-plate condenser, 1 tapped condenser, one L300 choke coil, one 2000-volt filter condenser, one 10,000 ohm grid-leak, plug and jack connection for microphone buzzer and CW, one 600 volt 220 watt motor generator. Boxed for shipment, $350.00 f.o.b. St. Louis, Mo.



Benwood Bakelite Dial

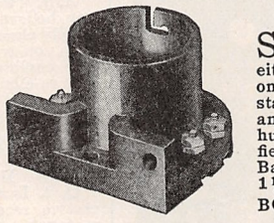
SOLID Bakelite throughout—highly polished. Has extra large, tapered knob, which fits the fingers perfectly. The knurling is particularly fine and sharp, affording an excellent grip. Graduated 0° to 100°, all markings clearly defined in white and stamped into the solid Bakelite — won't wear off. Ribs on reverse side prevent turning too far. Dial lies perfectly flat against your panel and will not warp or buckle.

BC-7, Dial, 4″ diam., each..... **$2.00**

BC-8, Dial, 3¼″ diam., each..... **1.75**

Benwood Binding Post

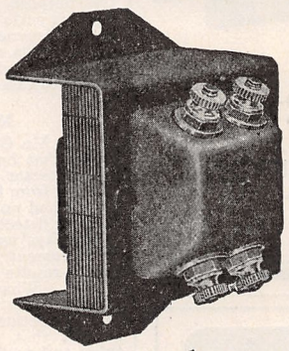
HAS tapered, knurled, solid Bakelite grip to match Benwood dials. Exposed metal parts highly nickel-plated. BC-16, as shown..... **20c**



Benwood V. T. Socket

SOLID, highly polished, molded Bakelite, specially designed for either base or panel mounting—the only one of its kind. Firmly holds any standard four-prong detector or amplifier tube. Minimizes ground hum and noises in operation of amplifiers. Terminal posts plainly marked. Base is 2⅜ inches square, height 1½ inches.

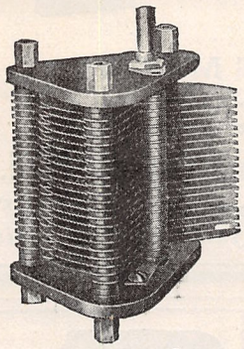
BC-10, each..... **$1.00**



Benwood Audio Transformer

COMPLETELY sheathed in metal, avoids all inductive effects and gives full 4 to 1 amplification without howling or squealing. Base is 2⅝″x3⅜″, height only 2 inches — ideal for either base or panel mounting. Core is best laminated steel, giving highest transference of energy. Use it with any amplifier tube and get strong, clear signals.

BC-6, each..... **$5.00**



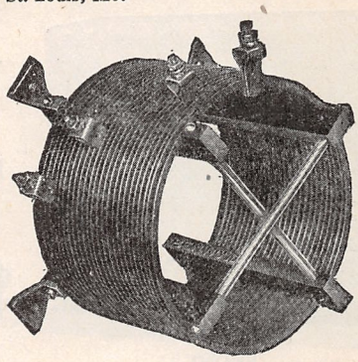
Benwood Variable Condenser

NOTE the improved stationary plate, design—*this condenser has the greatest capacity for over-all size of any variable condenser made.* Single bearing, wiping contact assures positive connections. Heavy aluminum plates will not bend or buckle. Bakelite ends.

43 plate, .0015 mfd., each, **$5.00**

21 plate, .0008 mfd., each.... 4.00

11 plate, .00025 mfd., each..... 3.75



Benwood C.W. Inductance

THIS is the only CW Inductance made for panel mounting. The copper ribbon is wound on FORMICA supports, giving highest possible insulating qualities. Each Inductance furnished with four of the new type BENWOOD PATENTED HELIX CLIPS, which will fit either a round or flat surface. Each clip furnished with moulded insulated handle which enables tuning of the set with current on.

Standard size, as shown in cut, consists of 25 turns of edgewise wound soft drawn copper strip 3/16 inch in width and 1/16 inch in thickness. Turns are full 6 inches in diameter. Type BC-15, for wave-lengths under 250 meters, each.... **$8.50**

Type BC-16, for wave-lengths over 250 meters, each..... **12.50**

CATALOG: Send 10c in stamps for the Benwood catalog and price list, also complete catalog and price list of DeForest radio equipment.

DEALERS: We manufacture a complete line of radio apparatus. We have stock on hand and ready to ship. Write or wire for our attractive proposition. New price list just issued.

Use This Coupon

TEAR HERE

The Benwood Company, Inc. 1111 Olive St., St. Louis, Mo.

Enclosed is 10c in stamps —please send me your up-to-date catalog and latest prices.

Name.....

Address.....

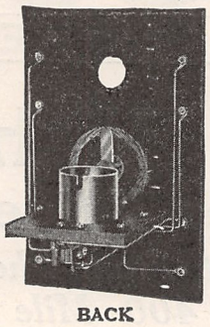
City State

THE BENWOOD CO., INC. 1111 OLIVE STREET ST. LOUIS, MO.

IMPROVE YOUR RADIO SET

and Listen In to Europe

FRONT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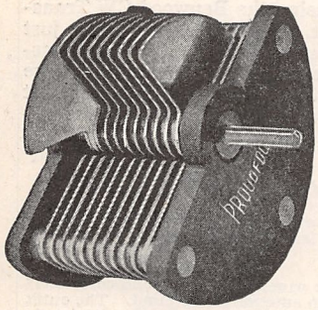
USE

PROUDFOOT
RADIO APPARATUS

$15.00
Detector Unit

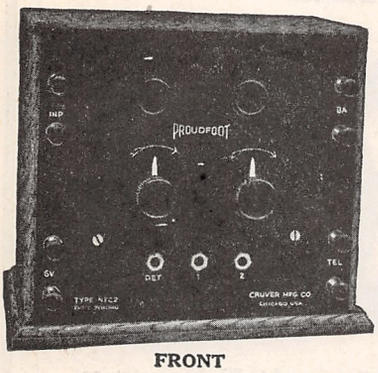


The new one knob Vernier Condenser, Price $6.50
Honey Comb tuner built with 3 Vernier one knob Condensers, Price $45.00

Proudfoot Radio Apparatus
IS
Built Like a Watch

SPECIAL FEATURES

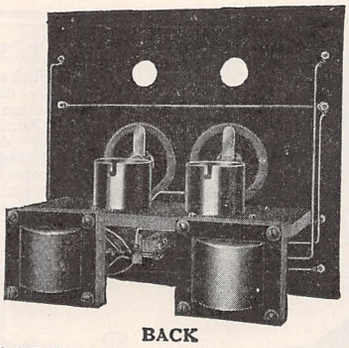
BUS-BAR JACKS—permitting shortest possible wiring
BUILT IN CONDENSER AND GRID LEAK
CLOSED CORE TRANSFORMERS
BUILT IN RHEOSTATS
DIRECT CONNECTIONS WITHOUT LUGS
REMOVABLE PANEL—NO SCREWS
Vernier Rheostat For All Detector Tubes



FRONT

TWO-STAGE
AUDIO
FREQUENCY
AMPLIFIER

$35.00

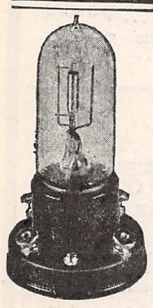

BACK

ALL UNITS MATCH

Detector and 2-stage Amplifier - - - - $45.00
Detector and 1-stage Amplifier - - - - 35.00

CRUVER MFG. CO., 2456 W. Jackson Blvd., Chicago, Ill.

Most dealers can supply you with PROUDFOOT RADIO PRODUCTS. If yours cannot, write us



NA-ALD
Special
Socket, W. D. 11

Designed especially for the new tube of the Radio Corporation which is operated by a single dry cell. Special clips of phosphor bronze with side wipe and strong gripping action on contact pins. Nickel plated binding screws. Highest quality throughout. Moulded from Condensite. Price 75c.

ALDEN-NAPIER CO.
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COLE

When you buy a *Variable Condenser*—buy a good one.

A. B. COLE, Inc.
88 E. Kinney Street - - Newark, N. J.
Send For Bulletin

WANTED—Back numbers of Radio News, Sept., Oct., Nov. and Dec., 1921, Jan. and Feb., 1922. Experimenter Publishing Co., 53 Park Place, New York City.

VARIOMETERS

(560) Mr. Seimer, of New York, wishes to know:

Q. 1. Are the windings on each side of the rotor in a standard variometer connected in series with the winding running in the same direction throughout?

A. 1. Yes. The wire should be wound on each half so that when the two center ends are connected, the entire winding will be in the same direction.

Q. 2. Is the primary of a variometer connected in any way to the secondary?

A. 2. One of the rotor leads is connected to one of the stator, or outside winding leads. The terminals of the variometer consists of the remaining leads to the rotor and the stator. Thus, it is evident that the rotor or secondary is connected to the stator or primary.

Q. 3. How should a set consisting of a variocoupler, variometer, variable condenser and vacuum tube be connected?

A. 3. The April-May issue of RADIO NEWS contained a circuit suitable for such apparatus. Another circuit appeared in the October issue.

RECEIVER TROUBLE

(561) Mr. George Damm, Jr., of Carleton, Nebraska, wishes to know:

Q. 1. How may I increase the wave-length of my honeycomb receiver? I enclose the diagram I am using.

A. 1. We would suggest that you put a variable condenser of .001 mfd in shunt to the secondary. To receive longer waves, it will only be necessary to insert larger sized coils.

Q. 2. I cannot make my receiver oscillate on waves over 400 meters. What is the trouble and how may I remedy same?

A. 2. It appears that the size of the tickler coil is not correct. It would be advisable to employ a coil of 75 or 100 turns in the tickler socket. We would also suggest that a fixed condenser of .001 mfd be shunted across the primary of the first transformer.

Question 486 of the October RADIO NEWS contained additional information on the method of securing regeneration.

INDUCTION TROUBLES

(562) Mr. E. St. John, of Mena, Arkansas, writes:

Q. 1. The telephone company has an interrupter which operates on the 110 volt light circuit (AC) for ringing the telephone bells. The interrupter can be heard very plainly in receiving sets near the central office and is strong enough to drown out weak signals. I suggested to the manager that if he would enclose the set in a metal cabinet, and ground cabinet that the interference would be stopped. Was I correct and is there any other way of stopping the trouble?

A. 1. While your suggestion was of merit, we do not believe that the interference would be completely eliminated by this method. We would suggest that you try a counterpoise in place of the ground. The combination of both ideas would doubtlessly help in eliminating the interrupter hum. You might also try a trap circuit tuned to the frequency of the hum and inserted in your aerial lead in.

ALUMINUM SHIELD

(563) Mr. Maresca, of New York, asks:

Q. 1. Is aluminum efficient for shielding a regenerative receiver? I intend to use rather heavy material.

A. 1. The aluminum will be quite satisfactory for this purpose. Care must be taken to insulate all metallic parts of each instrument from the shield. Do not run connecting wires up against the metal, as it will act as a capacity conductor between the wires. Use a thorough ground connection and body capacity effects will be almost entirely eliminated.

MYSTERIOUS TROUBLE

(564) Mr. G. N. Hughes, of Marysville, Tennessee, writes that he has experienced considerable trouble with detector tubes. Using a standard regenerative receiver from instructions published in RADIO NEWS, he has had no difficulty from the amplifier, but each of three detector tubes have ceased to function after a few days' use. He has used normal plate and filament current and the filaments still burn brightly, but no results are obtained from the tubes. He asks:

Q. 1. What causes this failure?

A. 1. It is very difficult to assign a reason to this peculiar action without seeing the set. We would suggest that you write the manufacturer of the tubes and ask for an explanation.

ONE-STEP AUDIO

(565) Mr. A. C. Livingstone, of Montreal, Canada, asks:

Q. 1. Please show the circuit described by Mr. P. G. Watson in the June, 1922, issue of RADIO NEWS, with the addition of one-stage of audio frequency amplification. I have had remarkable results with this hookup.

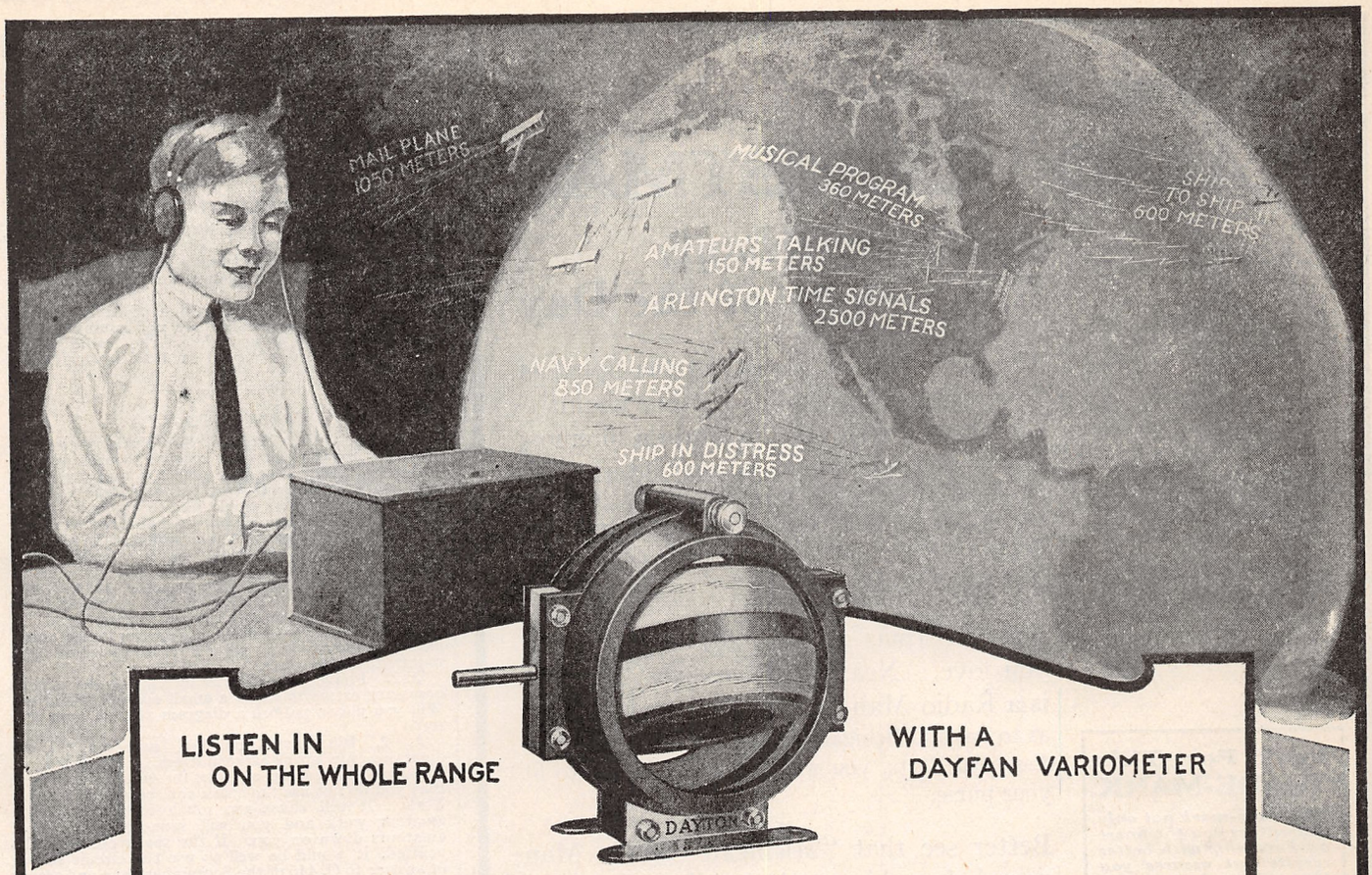
A. 1. Our October issue contained an article by Mr. Watson describing the construction of such a set together with two stages of audio frequency amplification. We would suggest that the two-step be constructed as the extra cost will not be very great. This circuit generally works well with an amplifier tube as detector.

D.C. GENERATOR AS "A" BATTERY

(566) Mr. C. R. Cadman, of Toronto, Canada, wishes to know:

Q. 1. May I employ a motor generator delivering 6 V. D.C. instead of the storage battery to heat the filaments of my radio receiving set?

A. 1. It would be possible to do this, but if an audio frequency amplifier is used, we believe you would experience a disagreeable commutator hum.



LISTEN IN
ON THE WHOLE RANGE

WITH A
DAYFAN VARIOMETER

The World Is Getting Smaller Every Day!

DAYFAN Variometers and Variocouplers make the world still smaller with their exceptional *range* of *wave* lengths.

Assemble your own sets with DAYFAN Radio apparatus, so you can change the arrangement as needed to meet the developments that are bound to come.

Write for Complete Catalogue, free, and mention your dealer's name and address.

The Dayton Fan and Motor Company

Factory and General Offices

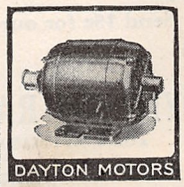
503 Dayfan Block, Dayton, Ohio

Established 1889

THIS TRADE MARK APPEARS ON

ALL DAYFAN RADIO APPARATUS

DAYTON



We Wish You a Very

RADIO CHRISTMAS

and Many Happy Broadcasts of the Day

The Spirit of Christmas like the Spirit of Progress has broken its earthly chains—Christmas carols by the world's foremost singers, along with minute-old news of happenings in far off Tibet, sound constantly over the ether waves, not to the thousands of yesterday's but *to the millions "listening in" on the dawn of the Age of Radio.*

For Christmas give a Radio Set to those you love. Near you, wherever you live, is a Radio Man—and, if he is so fortunate as to have "Michigan" Complete Radio Sets and Essential Parts, you will find a reliable set to fit your purse.

Better see that "Michigan" Radio Man now before his stock is all spoken for. Or write us direct!

Look For This TRADE-MARK

This trade-mark not only guarantees you the finest workmanship with better results but assures you that the products carrying the imprint are backed up by one of America's most solidly-founded radio manufacturers—an important consideration when buying radio service.

Dealers who desire better radio apparatus, better shipping service and a better selling basis should get in touch with us while production permits us to consider new connections.

MICHIGAN RADIO CORPORATION MICHIGAN

QUALITY RADIO PRODUCTS

Grand Rapids, Mich., U. S. A.

MOST COMPLETE RADIO STOCK IN DENVER

- Clapp-Eastham Receiving Set
- Grebe Receiving Set
- Kennedy Receiving Set
- Murdock Equipment
- Jewell Meters
- Acme Transformers
- ESCO Motor Generators
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Send 15c for our "Catalogue"—Refund on first order of $5 or over

OPERATING KLZ AND 9ZAF

REYNOLDS RADIO CO., Inc.
1524 Glenarm Street

DENVER
COLORADO

Insure your copy reaching you each month. Subscribe to Radio News—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

If you do use the generator it would be well to place several large condensers of about 2 mfd across the 6 V. terminals. A few choke coils (iron core) in series with the generator leads would further assist in reducing the usual hum. It would be possible to utilize the two circuits, shown on these pages, wherein a crystal is used for detection and one or more vacuum tubes are used as radio frequency amplifiers.

REGENERATIVE PATENTS

(567) Mr. W. F. Clinsmith, of Wakita, Oklahoma, wishes to know:

Q. 1. Where may I obtain a license for constructing regenerative receiving sets, under the Armstrong patents?

A. 1. The Radio Corporation of America, holds the Armstrong patents but are not issuing licenses under same at the present time. The Radio Corporation of America is located at 233 Broadway, New York City.

CRYSTAL TO V.T.

(568) Mr. Allen Fitch, of New York, writes:

Q. 1. I have a crystal receiver consisting of a two-slide tuner, a crystal detector and a pair of 3,000-ohm phones. Having had remarkable results with this small set, I would like to change it into a tube set. Could I employ all the material I have now and make a good regenerative vacuum tube receiver?

A. 1. It would be possible to use the phones and two-slide tuner in a regenerative set. A suitable circuit was published in the October, 1922, RADIO NEWS in answer to Q. 477. It will be necessary to secure a vacuum tube, a socket, a rheostat, "A" and "B" batteries, a fixed phone condenser and a grid condenser. The antenna series variable is not required, though it would be of some benefit.

Q. 2. I have a one-quarter inch spark coil and the necessary extras to make a small spark transmitter. Will you please publish a diagram of such a sending set?

A. 2. We have published numerous circuit diagrams for spark transmitters. It would be advisable to inspect past issues for same. We suggest that you do not use the spark coil, especially in New York. It will cause too much interference with amateur work and you will soon have the local amateurs down on you. If the spark coil must be utilized, it would be well to use the circuit shown in answer to Q. 446 of the September issue and secure licenses.

Q. 3. If I add a second wire to my single wire aerial, will it improve results greatly?

A. 3. The results in reception will be practically the same, but if a transmitting set is used, the two-wire aerial is preferred.

INFORMATION ON R.F.T.

(569) Mr. C. W. O'Neill, of Brooklyn, New York, asks:

Q. 1. Where may I obtain data on radio frequency transformers and radio frequency amplifying circuits?

A. 1. The Electro Importing Company, 233 Fulton Street, New York, publishes a small booklet on this subject. Their advertisement will be found in this and other issues of RADIO NEWS.

FIXED COUPLING

(570) Mr. H. S. Brown, of Fresno, California, writes:

Q. 1. In designing a radio receiving set of the three-circuit type, may I make the antenna and secondary coupling fixed instead of variable?

A. 1. It is quite possible to employ fixed coupling. The distance or angle of coupling for best results should be determined by actual experiment. However, we would advise that a variable coupling be employed for the sake of additional selectivity.

TUNED IMPEDANCE COUPLING

(571) Mr. U. V. Williamson, of Chicago, Illinois, writes:

Q. 1. Is the radio frequency amplifier, consisting of tuned impedance, of much benefit in long distance reception?

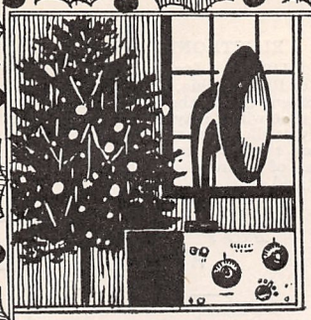
A. 1. A receiver consisting of two or more stages of tuned impedance radio frequency amplification should enable long distance reception, if carefully designed, constructed and operated. The operation is quite difficult due to the multiplicity of controls. We would suggest that you make a careful investigation of radio frequency amplifying circuits before constructing such a receiver. It would also be advisable to make a "laboratory set-up" before placing the instruments on a panel. All leads should be as short as possible, and all spring contacts, such as in a vacuum tube socket, must be perfect. A single incorrect connection will cause failure of operation, so be certain that all connections are correct.

New Radio Patents

(*Continued from page* 1072)

shaft. In previous arrangements set screws have been used for this purpose, and these are inconvenient and unsightly.

In this useful invention the preferred form is indicated in the diagrams. The knob and dial are separate. The dial is provided with a split, tapering, and threaded tubular post through which the shaft may be passed. The knob is provided with a tapering



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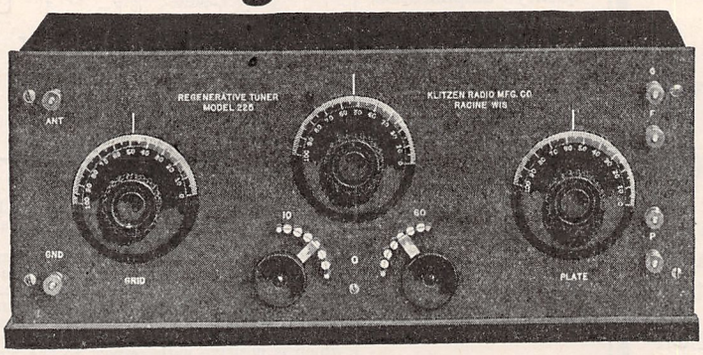
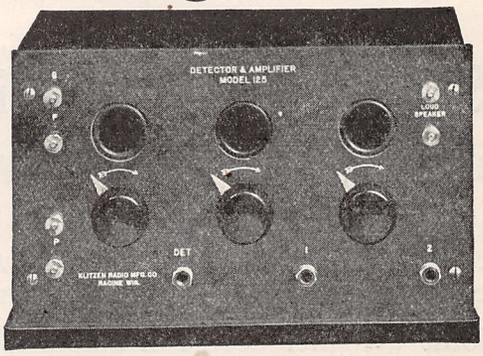
KLITZEN RADIO

Mfd. Under Armstrong License U.S. Pat. No. 1,113,149

Long-Distance Receiving Sets



No. 225—Tuner Unit, $60



No. 125—Detector and Amplifier, $60

The One Best Christmas Gift!

GET your order into your Radio dealer at once, as the demand threatens to overtax even our large manufacturing facilities.

The Klitzen Set is for **long-distance** as well as local service. Here, in Racine, we easily pick up Schenectady, Newark, Atlanta, Pittsburgh, Detroit, Minneapolis, Kansas City, St. Louis, Denver and stations in between.

Chicago, Milwaukee and Madison come in so strong that we have to "tune them down" for comfort.

By buying a **Klitzen** set you are not only sure of clear, satisfactory long-distance receiving, but you are protected against "buying a lawsuit." This caution also applies to dealers.

CHOICE OF SETS

No. 225 and 125 illustrated above, hooked up together, constitute a highly efficient long-distance Receiving Set, complete, except for tubes, batteries and head phones or loud speaker —two units..... **$120.00**

No. 300, not illustrated—similar to unit No. 225 but with detector added, will receive from several hundred miles, but cannot be used with loud speaker. Price..... **$75.00**

No. 150. Three step amplifier, when added to No. 300 makes a set that reaches from coast to coast and can be used with loud speaker. Price..... **$75.00**

Your dealer will supply the necessary tubes, batteries, head phones and wiring equipment at equally reasonable prices, and will install your outfit —a very simple task— at the per hour cost of labor.

Built Under Armstrong License

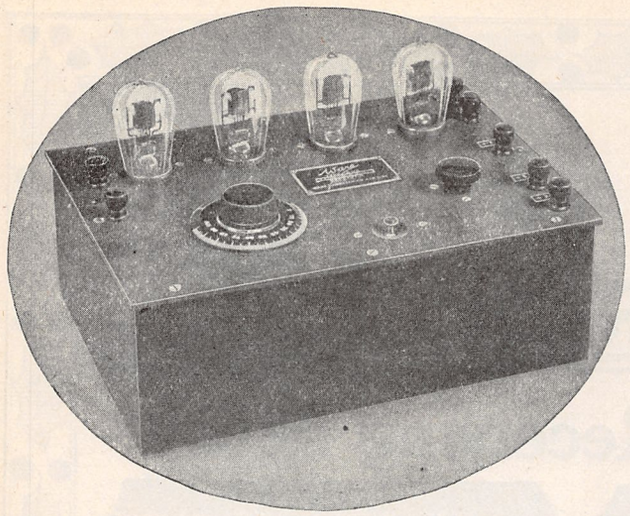
The only kind of Radio Receiving Set that can be depended upon is an **Armstrong Regenerative** Set. Regenerative Sets can be built only by firms licensed under Armstrong U. S. patent 1,113,149.

No Christmas Present you can give to your family, your friends, relatives or to **yourself,** will be a source of such endless pleasure and profit—the year 'round; and year after year.

Tell your dealer you must have a "Klitzen"— no substitute will do. Send for descriptive circular

KLITZEN RADIO MFG. CO.

Racine, Wisconsin, U. S. A.



It IS The Most Sensitive Receiving Set—and Proved

For the utmost in distance, selectivity, sensitiveness and clarity the Ware Type AD2 Receiver has startled the entire radio industry.

It affords a higher degree of amplification and wider tuning range than ever before obtainable. With clear, crisp and perfect tone reproduction the Ware Type AD2 Receiver readily brings in broadcasted programs hundreds of miles on 1-foot indoor coil aerial.

Price $110 (without tubes)

It is simple to operate—beautiful—compact—and guaranteed by a highly skilled and strongly organized corporation. Order direct from this advertisement or send for further particulars. (Dealers' correspondence invited.)

Ware
TYPE AD2
R-F AMPLIFIER-DETECTOR
RECEIVER

Here Are the Facts

Here are but a few of the reasons for the supremacy of the Ware Type AD2 Receiver.

1. It embodies NEW and exclusive inventions, perfected after 5 years of continuous experiment.
2. If affords the highest radio frequency amplification (per stage) and widest tuning range ever offered.
3. EASILY receives signals which are totally inaudible on the usual regenerative type receivers.
4. Makes genuine loose coupling possible.
5. Is ideal for loud speaker.
6. For faithful long or short distance reception—free from distortion, static, induction and interfering transmitters — it has never been equaled.

Get one—use it—then you'll know what real radio enjoyment is.

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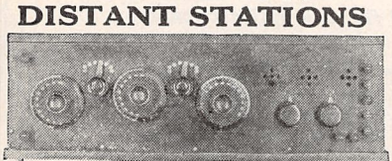
TUNE IN
DISTANT STATIONS



F. R. S. Complete Two-Stage Long Range Receiver

Set includes two Federal transformers, condenser, two moulded variometers., molded variocoupler, three V. T. sockets, filament rheostats, dials, Read 'Em binding posts, switch points in attractive cabinet and drilled panel complete, ready to hook up. A $125 Radio for... $40

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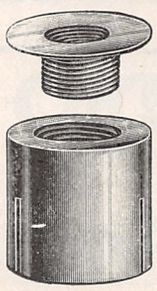

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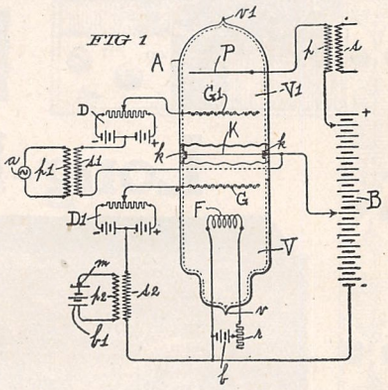
threaded sleeve which, when screwed on to the post of the dial, holds both knob and dial firmly to the shaft.

Other similar constructions are covered by the patent.

ELECTRONIC APPARATUS

(Patent 1,419,547. Issued to Cornelius D. Ehret, of Philadelphia, Pa. June 13, 1922)

This patent covers the invention of a new type of vacuum tube which may act as the generator of high frequency oscillations and, by a special arrangement, modulates the high-frequency oscillations by the variations of microphonic current impressed on a separate grid.



The design of this tube is shown in Fig. 1. The tube is separated into two sections by a cathode, k, which is composed of a thin piece of tungsten or platinum. This cathode seals the chamber V from V1. When electrons are emitted by the filament F, the cathode k is bombarded and becomes an electron emitting body. The grid G in the chamber V may be held at any desired potential with respect to the filament. The cathode k is held at some potential which is positive with respect to the filament. The grid G1 is in the separate chamber; V1 may be held at any desired potential, and the plate P is maintained at a positive potential with respect to the cathode k.

The circuit as shown in Fig. 1 illustrates the general principle of operation. High-frequency oscillations impressed on the primary of the transformers p1 are, of course, repeated in the plate circuit, and connected through the transformers p, s, to the radiating antenna. These circuits could, of course, be arranged to produce self-generated oscillations. The modulating current is impressed on the grid G, which introduces corresponding variations in the amplitude of the high-frequency oscillations.

VARIOMETER

(Patent 1,421,041. Issued to J. S. C. Townsend, of Oxford, England. June 27, 1922)

The subject of this invention is a variometer on which two ranges of inductance can be obtained.

The variometer is constructed of two fixed coils and two movable coils, one of the fixed coils being connected to one of the movable coils and the other fixed coil being connected to the other movable coil. Two pairs of connected coils are thus formed, and the required result is obtained by adjusting the coils so that the self induction of one pair is equal to that of the other pair for each position of the movable coils.

The invention is illustrated by the accompanying drawing, of which Fig. 1 is a diagram showing each fixed coil connected in series with a movable coil and Fig. 2 is a diagram showing each fixed coil connected in parallel with a movable coil.

Fig. 1.

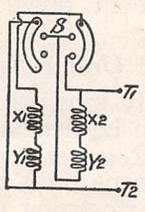
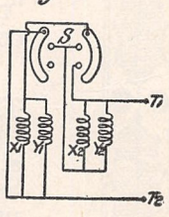


Fig. 2.



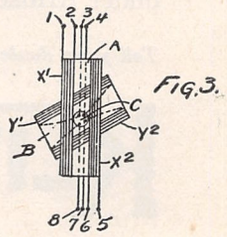


Fig. 3.

Fig. 3 shows how the four coils may be mounted. X^1 and X^2 are two fixed coils wound on a fixed frame A, and having their ends connected to wires 1, 2, and 5, 6, respectively. Y^1 and Y^2 are two coils wound on a frame B which can be rotated about pivots C in the frame A. These two coils have their ends connected by flexible leads to wires 3, 4, and 7, 8, respectively. By joining wire 2 to wire 3 and wire 6

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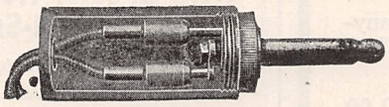

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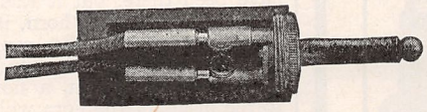

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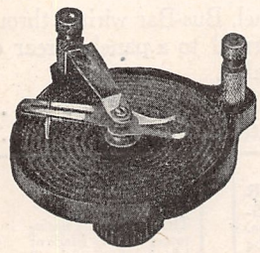

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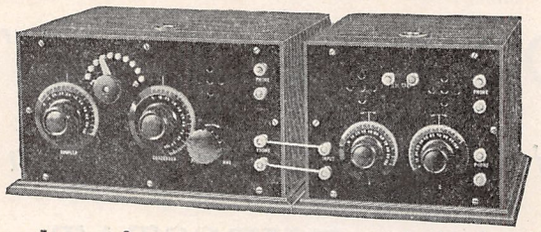

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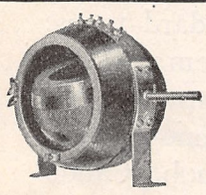

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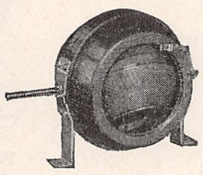

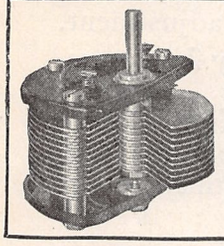

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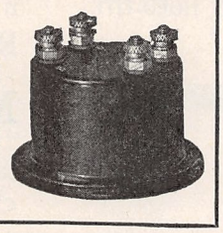

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to wire 7, the four coils will be arranged as shown in Fig. 1, that is, with X^1 in series with Y^1 and X^2 in series with Y^2, while by joining together wire 1 to wire 3, wire 2 to wire 4, wire 5 to wire 7 and wire 6 to wire 8, the four coils will be connected as shown in Fig. 2; that is, with X^1 in parallel with Y^1 and X^2 in parallel with Y^2.

The coils are adjusted so that for each position of the moving coils the self-induction of the pair X^1, Y^1, is equal to that of the pair X^2, Y^2.

This result may be obtained by making the coils X^1 and X^2 of the same size and same self-induction and having them similarly situated with respect to the axis of rotation of the coils Y^1 and Y^2 and by making the coils Y^1 and Y^2 of the same size and same self-induction and having them similarly situated with respect to the axis of rotation.

The two pairs of coils are connected to a series parallel switch S by means of which the pair X^1 Y^1 can be connected either in series or in parallel with the pair X^2 Y^2, the total inductance of the two pairs in the first case for any position of the coils Y^1 Y^2 being four times the total inductance of the two pairs in the second case for the same position.

T^1 and T^2 are the terminals of the variometer.

The Influence of Horn and Diaphragm on Sound Waves With Special Reference to Radio Loud-Speakers

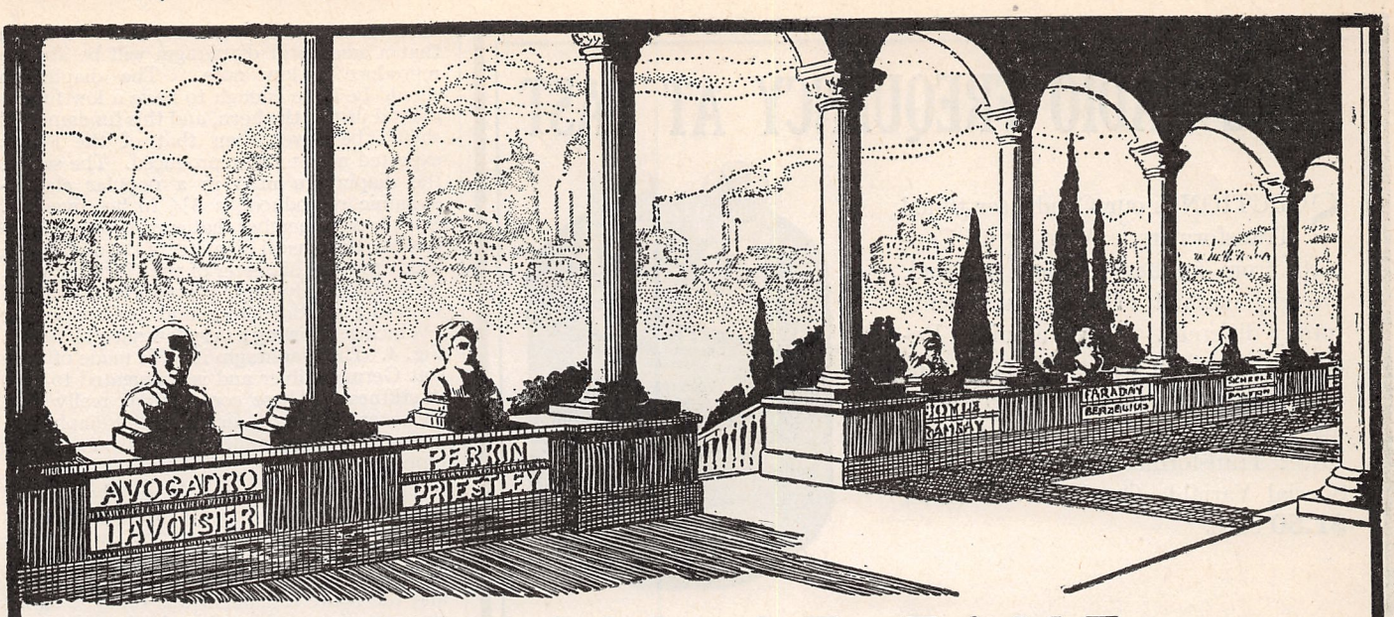
(*Continued from page* 1053)

purpose of reproducing and reinforcing the air vibrations from the diaphragm of their electrodynamic receiver, Fig. 2. The sizes are made with constant taper and with medium flare with bell diameters of 14 inches for the small horn and 18 inches on the larger horn. In spite of the fact that there seemed to be in the minds of some a prejudice against the use of heavy gauge metal in these horns, the metal seemed to be the only thing to use from a quantity production point of view. It was reported that some of these metal horns had a tinny sound and this tinny sound was due to the horn being made of metal. The tinny sound may undoubtedly have been there, but it was not due to the reproducer or to the horn, it was simply an inherent part of the reproduced music. However, by carefully studying the principles of horn design, a finish was applied to the inside of the horn which absorbed the objectionable tinny frequencies, so that when they were heard by the ear the tinny sound was removed from the vibrations. In this way, by the use of a special rough acoustic enamel finish all objections, real or fancied, were removed from the use of the metal horn, and all horns now made by this company have this type of acoustic finish which makes the inside of the horn quite rough. This finish also stiffens the horn wall. The roughness of the finish can be controlled, and many experiments were made to find out just how rough the surface should be. Of course, a tinny sound is inevitable if the metal is too thin, because of self-vibration. Only heavy, soft and non-resonant metal can be used.

The mounting of the diaphragm also has a great effect upon its action. When a diaphragm is mounted it really is operating in two separate and distinct cavities, each one of which will produce its own distinct resonance effects. These two effects will react one on the other through the medium of the diaphragm and may or may not react to the harmful exaggeration of certain tones and the total elimination of others.

Experiment has shown that the back must be uncovered, although it may be enclosed if not too tightly. The front must be covered and an extremely good fit obtained between the cover and the horn. This can easily be proven by partially withdrawing the horn from its socket so that a leak is obtained. It will then be found that even for a very small leak volume is lost, and also that certain qualities are changed in the reproduced music. The best results by far are obtained by using a shallow cup-shaped front cover with an opening for the horn which should be about one-fourth of the diameter of the diaphragm. (See Fig. 3.)

The size of the diaphragm is also important. It is obviously not to be expected that a very small diaphragm can set a huge column of air



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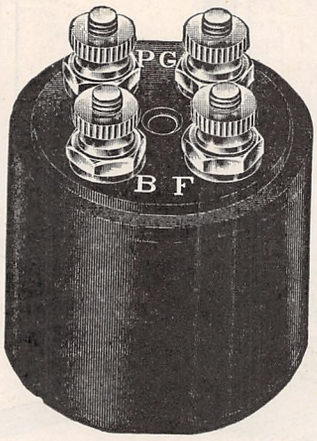

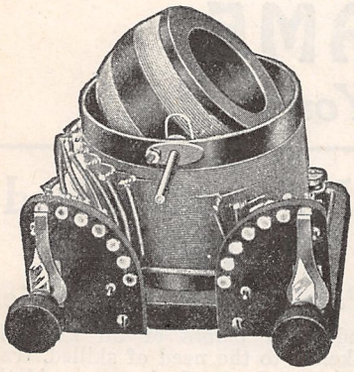

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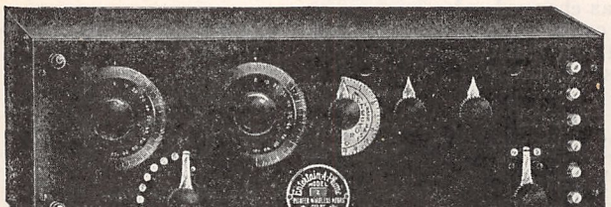

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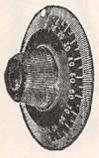

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in resonance, and it is also beyond expectation that a small stiff diaphragm will be able to reproduce a low note. The diaphragm should be large enough to have a low fundamental just as the horn, and this fundamental should be lower than that of the lowest expected note to be reproduced. The size of the diaphragm used in a popular electrodynamic reproducer is 3⅛ inches over all. But please remember that even in a telephone receiver the overall diameter of the diaphragm is not the real diameter of the vibrating part. In the electrodynamic reproducer the actual vibrating portion, free and unclamped, is 2⅜ inches, allowing a very low natural period, Fig. 4. The diaphragm itself is made of very soft German silver and is corrugated to give it stiffness. These corrugations really give a greater grip on the air than a flat diaphragm and aid in that manner as well as in the good reproduction.

The above discussion is simply a brief résumé of the experimental work which has been and is still being carried out by the Research Department of a large Western manufacturer of loud-speaking reproducers, and the entire discussion was brought on by the editorial of Mr. Gernsback, Editor of RADIO NEWS, in the October number of that magazine, with which we fully agree. We wish simply to point out to the radio public that the problem of sound reproduction is *not being forgotten*, and that many men are working and many thousands of dollars are being spent to bring radio reproduction to the very peak of perfection, as improvements are constantly being made. These improvements are being incorporated in the commercial apparatus which the public is using, with the hope that it will increase the enjoyment and practical use of radio, so that radio will come to be one of the world's indispensable utilities in the shortest possible space of time.

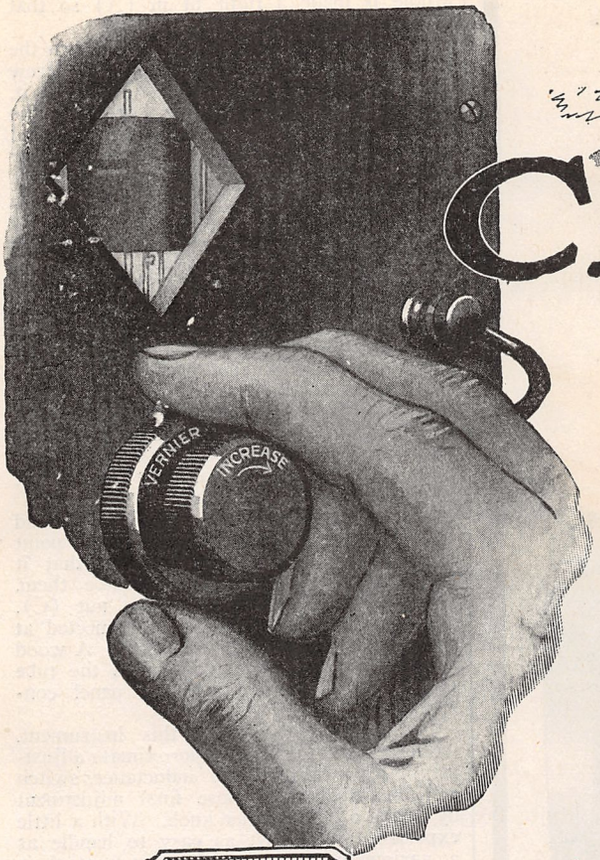
Substitute Variometer

(*Continued from page* 1089)

a bakelite tube or one of a similar insulating material is wound along its length with copper wire. The section at the right is wound with No. 24 D.C.C. wire, with a total of 48 turns, and tapped at every sixth turn. This is the "coarse adjustment." At the left is a second section connected in series with the first, this consisting of seven turns of No. 20 bare copper wire and carefully wound in helix form for a rubbing contactor. This is the "fine adjustment" or vernier coil. The tube is 3½ inches in diameter and about 3½ inches long.

A small detail shown in the corner of the sketch illustrates the method of retaining the bare vernier wire so that it will not shift under the movement of the sliding contactor. In the first example the wire is laid in helical grooves cut in the cylinder similar to screw threads. In the second example the wires are spaced a short distance apart and held immovable by a fine cord wound between adjacent turns of the wire. These cords can be covered with glue just before winding and will be found to hold securely after the glue is set. The first method, however, is the most secure and better job of the two and can be quickly performed on a screw cutting lathe.

The contactor (D) runs along the length of bare coil of wire. This thin flexible copper brush is attached to the shaft (S) by a short sheet brass arm (E), the arm being soldered to the shaft. The shaft is a ¼-inch threaded brass rod which turns in the brass nut (C) and the two bearing bushings of brass tube marked (B) and (B′). The bearings in turn are supported by short wooden pieces (A) which are securely attached to the tube by small



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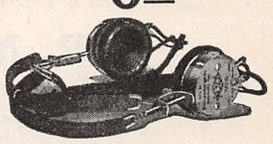
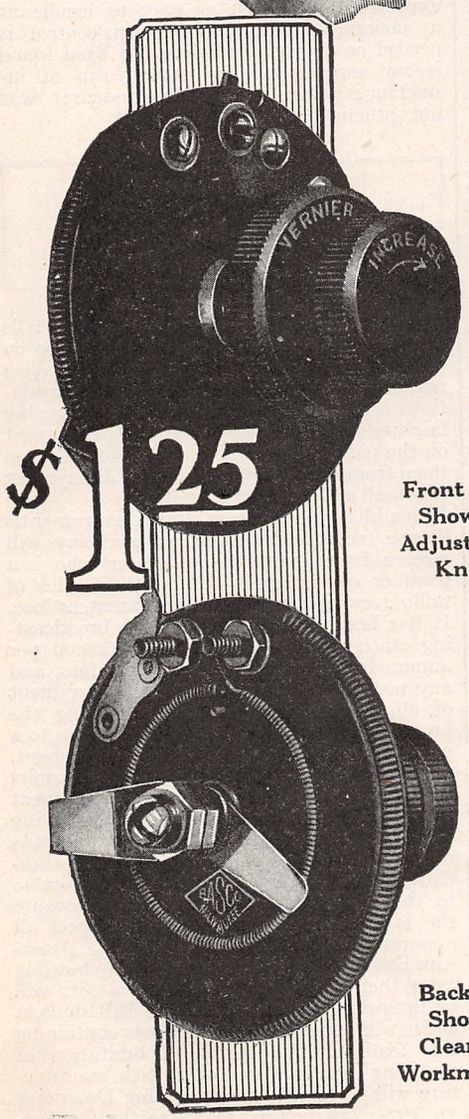
Get more out of your set with a Basco Vernier—the super-delicate filament rheostat. Costs no more than ordinary rheostats. Ask your dealer to show you one. If your dealer or jobber can't supply you write us.

$6.00





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Front View Showing Adjustment Knob

Back View Showing Clean-Cut Workmanship

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Super-sensitive Receivers:	
2000 Ohm	$6.00
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Also Variocouplers, Variable Air Condensers, Tube Sockets, Switch Assemblies, Crystal Sets complete or as parts, Binding Posts, etc.

Jobbers and Dealers: *Write for extra liberal discount and name of our nearest local factory representative.*

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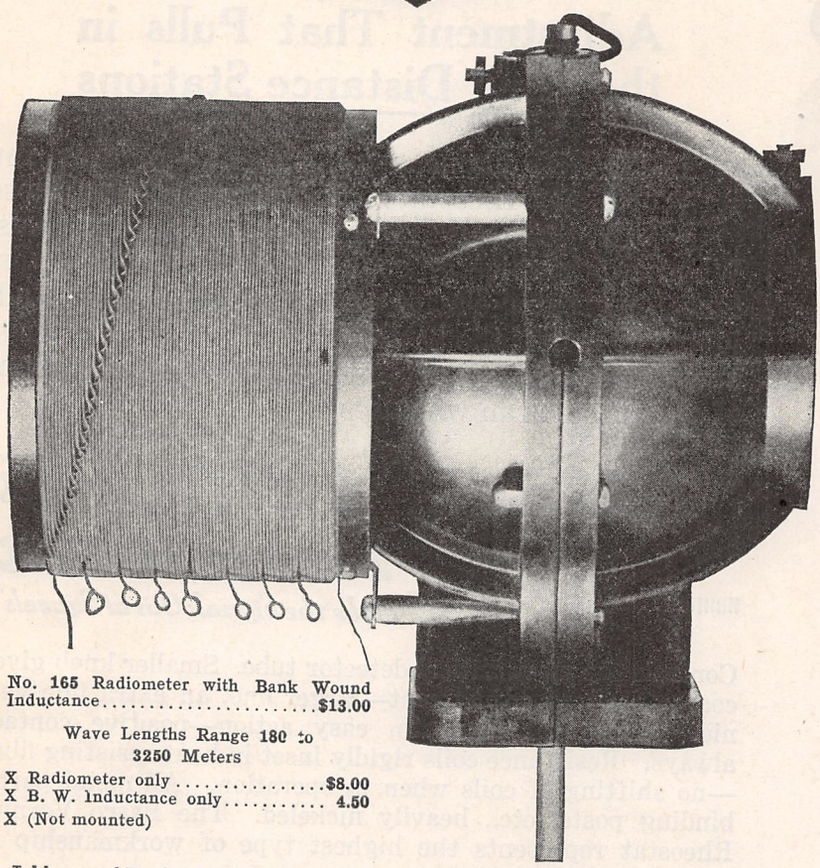
Milwaukee — A BASCO PRODUCT — Wisconsin

The Hit of New England

SE-AR-DE

Radio Products



No. 165 Radiometer with Bank Wound Inductance.....$13.00

Wave Lengths Range 180 to 3250 Meters

X Radiometer only.....$8.00
X B. W. Inductance only..... 4.50
X (Not mounted)

Jobbers and Dealers write for discounts on the above. We also manufacture knob and dial, bakelite socket, vario coupler, bank wound inductance, variable condenser, insulated binding posts, contacts, C. W. Inductances, choppers and phonocaps.

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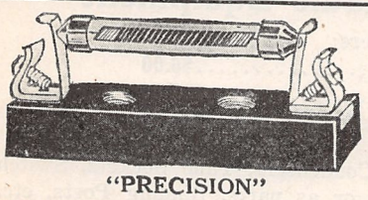
For 47 yrs. Mfrs. of Scientific and other equipment. Look for trade mark on every piece.



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GRID LEAKS AND MOUNTINGS

Resistance Ranges from .25 Megohms to 5 Megohms. Accuracy Guaranteed

GRID LEAKS.....75c
MOUNTINGS.....50c

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47 NEW STREET, NEWARK, N. J.

SPAULDING Fibre PRODUCTS

SPECIAL PARTS TO BLUEPRINT

Sheets, rods, tubes, everything in Fibre for the Radio Mfgr.

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HAVE YOU SOMETHING TO SELL OR EXCHANGE?

A classified ad in Radio News will reach over 235,000 at a cost of only 15 cents a word

screws or escutcheon pins. The nut (C) is soldered to the sleeve (B) and the whole is made a tight fit in (A) so that it cannot turn.

It is now apparent that when we turn the knob at the end of the shaft the screw shaft and brush (D) will turn with it. The shaft also moves in or out along the length of the tube owing to its threaded engagement with the nut (C). In other words, if the spacing or "pitch" (P) of the wire is the same as the pitch of the screw thread, then the brush will faithfully follow along the turns of wire while the knob is being turned. The changes in inductance can be as small and as many as desired. This is of great importance in bringing a circuit into resonance. The shaft should not be given more than 20 threads per inch and if possible a somewhat larger shaft should be used even if only to gain a coarser thread. When grooves are cut in the cylinder for the reception of the wire they should of course have the same pitch or number of threads per inch as the screw shaft.

The connections of the tapped right hand section of the winding to an eight point inductance switch are so common that it seems hardly necessary to describe them. One connection is made to the nut (C), while the remaining circuit is connected at the shaft of the inductance switch. A wood support is supplied at (F) when the tube is to be laid horizontally for panel construction.

In tuning or adjusting this instrument, we first make the rough approximate adjustments by means of the inductance switch and then make the close final adjustment by means of the vernier knob. With a little experience it is just as easy to handle as a variometer and where sharp control is needed on very critical circuits I have found it far superior to any other form of inductance where a variable condenser was not practicable.

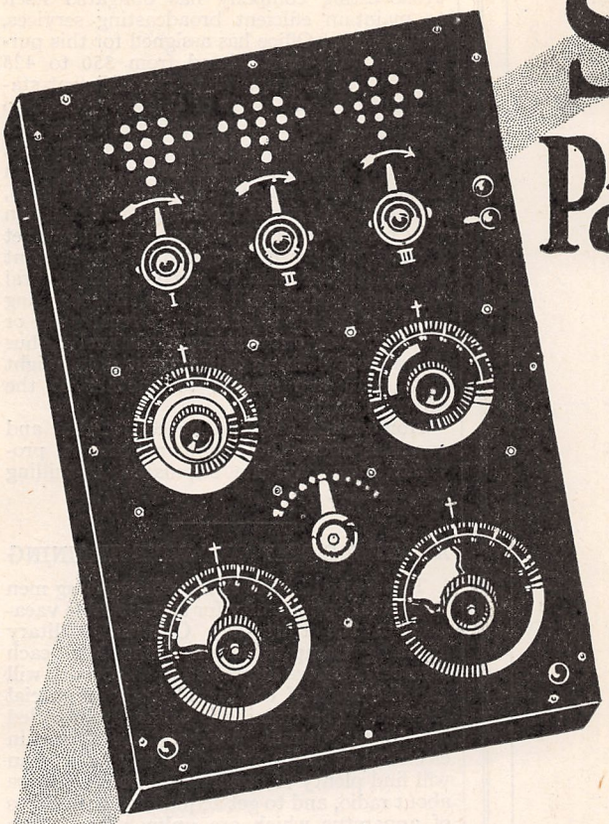
Radio Digest

(*Continued from page* 1087)

their cars when the distant signal lamp tells them to stop, even though there may be no policeman at hand to enforce it. Drivers realize that the Fifth Avenue traffic regulations are for their benefit and so they play fair under the rules. Much the same spirit on the part of our radio enthusiasts will keep them from trying to avoid the small payment which all are expected to make."

In addition to its share of the Government's license fee, the broadcasting company will receive from every manufacturer who is a member of it, fees based on their sales of radio receiving apparatus for amateur use. It has been estimated that each broadcasting station will cost about $90,000.00 per annum for operating and program fees, and any profits which remain after the payment of all charges will be divided among the broadcasting company's stockholders up to a maximum of 7½ per cent on their investment.

In order to protect the radio manufacturers from foreign competition, the Government has agreed not to license for use any receiving stations equipped with other than apparatus made by members of the broadcasting company. This will be a substantial protection to the public against inferior sets because the Post Office Department will inspect all apparatus before giving its approval. American listeners-in who are annoyed by howling from their neighbors' regenerative sets will be interested to know that the British Post Office will not approve of any sets containing this feature. The period of limitation of receiving sets to those of British manufacture will be for the period ending December 31, 1924; but before that time the Government has agreed to review the situation and



START RIGHT! Panel with B-D-XX!!

Your Radio Set will be as good as the panel that is the heart of a radio set.

Radio bases, walls and partitions should be made of Bakelite-Dilecto (X-X grade) to get absolute insulation and utter elimination of vibration.

Bakelite-dilecto!!

(A Laminated Phenolic Condensation Product)

Novice and professional alike all over the country loudly praise B-D-X-X, because it has proved itself positively perfect for paneling. Used by the United States Navy and Signal Corps *over eight years!*

Guaranteed Highest in tensile and dielectric strength (proved dielectric constant 5.2). Resists heat, water and milder acids and solvents. Cannot swell or warp. Amazingly tough, yet readily machined. Finished in a sleek, everlasting black.

Your electrical supply man can get B-D-X-X cut to your exact requirements. Write us today for more information about this astonishing material.

The Continental Fibre Company

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Dealer service from:

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Chicago, 332 S. Michigan Ave.
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San Francisco, 75 Fremont St.
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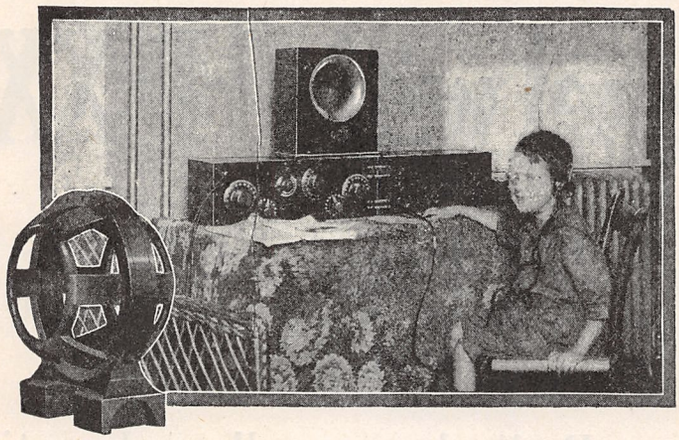
Amateurs

Ask us for names of dealers of Bakelite-Dilecto. Don't rush ahead and use just anything for panels. See B-D-X-X *first!*



Perfect Operation Insures Enjoyment

This molded Variometer Stator Frame possesses every desirable quality. It can be formed exactly as desired to hold the proper windings and combines the necessary mechanical strength with high insulating and dielectric properties.

Fine finish and appearance as well as exact dimensions, are acquired in the molding, and further polishing or tooling is unnecessary.

Unaffected by atmospheric and temperature variations, or by moisture, these molding materials have also the additional advantage of being resistant to oils and most chemicals and fumes.

Minute accuracy, strength, both dielectric and mechanical; permanence and stability—these qualities alone have justified this material for scores of applications. And simplicity of reproduction is demonstrating again and again that the best is actually cheapest in the end.

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DOUBLE HEAD PHONES

BOYS! A REAL RADIO SET ABSOLUTELY FREE

RUSH your name and address and we will tell you HOW you can get this RADIO SET ABSOLUTELY FREE. RADIO SET comes to you complete, with single slide tuning coil, crystal detector and phone condenser, AND DOUBLE HEAD PHONES. No batteries required; no experience. Write Today for Free Radio Plan.

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SAVE ON DETECTORS $1.50 SAVE ON AMPLIFIERS $3.00

We are repairing all detectors and amplifiers using a tungsten filament such as the following tubes, Marconi, Moorehead, De Forest, A.P. Electron relays U.V.200 U.V.201 C-300 C-301 and many other such tubes using a tungsten filament.

Repairing detectors and amplifiers for $3.50.

The repaired tubes we warrant will give you the same absolute satisfaction that you would expect to receive from new tubes.

We are now in a position to guarantee prompt deliveries and assure satisfactory results.

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Get a Handy Binder for your RADIO NEWS. Holds and preserves six issues, each of which can be inserted or removed at will. Price 65c. Experimenter Pub. Co., Inc., Book Dept., 53 Park Place, New York.

consider the continuation of the arrangement. During the period of restriction, the broadcasting company has obligated itself to maintain efficient broadcasting services, and the Post Office has assigned for this purpose a wave-length band from 350 to 425 meters. It is proposed to run different stations at different parts of this wave band so as to allow the maximum number of stations to work simultaneously without interference. Probably programs will be so divided in point of time among the various stations, that while a crystal receiving set which can only receive from the nearest station will get a good variety of program, more efficient sets which are able to receive from several different stations will be able, by changing from one station to another, to receive one or two types of entertaining exclusively; thus an amateur desiring dance music only, might shift from one station to another as the program changes.

Home-made sets can be constructed and operated under the new arrangements, provided they pay the stipulated 10-shilling Government fee.

AMATEURS MAY GET FREE TRAINING

The United States Army offers young men a splendid opportunity for an enjoyable vacation in the thirty-day Citizens' Military Training Camp which is being held each summer. Those interested in radio work will find the work of the Signal Corps of special interest. The training is primarily intended for those without previous experience in electrical or radio work, but any radio man will find plenty of opportunity to learn more about radio, and to get acquainted with types of apparatus which are unknown to those who have not been in the army.

The purpose of the C. M. T. C. is to train men for officers in the Organized Reserve. However, a man is under no obligation to the Government after attending one of these camps.

The United States is divided into several Army Corps Areas. There is one camp in each area, and all the men from that area are sent to that camp. The men attending camp have all expenses paid, but receive no further compensation. The Government pays the cost of transportation to and from camp, and supplies the men with food, lodging, clothing and medical attention.

The plans for the 1923 training period have not been fully completed, but it is expected that they will be very similar to the previous training periods. The first camp was held in 1921, and only infantry training was given. A great many more men attended the 1922 camp, and various organizations were formed, such as the Signal Corps, Infantry, Coast Artillery, Field Artillery, Cavalry, Air Service, Engineers, etc.

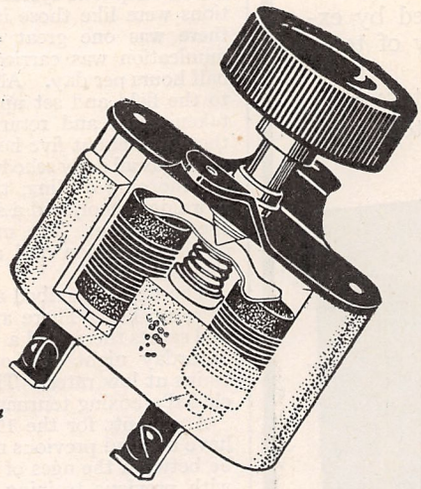
The work in Camp Knox may be taken as an example of that in all the 1922 C. M. T. Camps. Camp Knox, Kentucky, is located near the Ohio River, 31 miles from Louisville, Ky. There is a regular army camp, national guard camp, and other camps situated at Camp Knox. All of the C. M. T. C. applicants from the Fifth Corps Area, comprising Kentucky, Ohio, West Virginia and Indiana, were sent to this camp.

One company of Signal Corps was organized. This contained about 150 men. The company officers were men of considerable experience in signal corps work, especially radio. Among the students were many licensed amateurs, and others with experience in various branches of radio work, but the majority were men with no experience in electrical or radio work. There were at least two members of the Institute or radio engineers in the company.

The first few days in camp were spent chiefly in issuing equipment, medical examination, getting the organization in order, and learning the first principles of infantry drill and other things necessary in any branch of the army. Within a week signal school was started, and lectures were given on ele-

Better Adjustment than any Vernier Rheostat

Says Radio Editor Buffalo Eve. News



Retail Price
$1.85
Postage 10c extra

JOHN G. RIEGER
—RADIO EDITOR

BUFFALO EVENING NEWS
EDITORIAL DEPT.

BUFFALO, N.Y. July 29, 1922.

The Allen-Bradley Company
Milwaukee, Wisconsin
Gentlemen:

The value of the Bradleystat as a means to control the filament current in radio receiving sets is best appreciated by trial.

Most radio enthusiasts demand a sensitive vacuum tube in the detector. Best results are obtained only with critical adjustment on the filament temperature. Several years ago I learned the value of close regulation which brought in signals otherwise inaudible.

The first time I used a Bradleystat, I could scarcely conceal my joy at having found a rheostat that gave better adjustment than any vernier arrangement I had previously tried and all this in a movement of one knob. I believe that you have rightly named your rheostat —"The Perfect Filament Control." These rheostats easily carry two and one-half amperes without overheating. The minimum resistance of the Bradleystat is approximately three-fourths of an ohm. This is not detrimental, as it is never necessary, at any time, to reduce the resistance so low in the detector circuit.

I have been able to get, easily, variations of 25 micro amperes in a circuit using one of these rheostats.

I never recommend any apparatus through the radio column unless it has stood a rigid test.

Yours very truly,
John G. Rieger
RADIO EDITOR

The Secret of Bradleystat Control

A single knob varies the pressure on the two columns of graphite discs.

The change of filament current is so gradual and smooth that no vernier rheostat can duplicate the noiseless Bradleystat. An internal switch protects the A-battery.

The Bradleystat brings louder reproduction, quicker tuning, and a greater range. The adjustment is permanent and precise.

Remember the one-year guarantee and the twenty years of experience behind the Bradleystat. Write for latest bulletin, today!

Allen-Bradley Co.
Electric Controlling Apparatus
287 Greenfield Ave., Milwaukee, Wis.
Member of the National Radio Chamber of Commerce

Bradleystat

REGISTERED U.S. PAT. OFF.

PERFECT FILAMENT CONTROL

WIRELESS BESTONE TRADE MARK APPARATUS

The Wonders of Wireless —realized with BESTONE RADIO APPARATUS

"BESTONE" in the radio field is a symbol of QUALITY. To the Radio enthusiast it is a guide to satisfaction and dependability in the purchase of wireless equipment.

Superior "BESTONE" Features

The Bestone V. T. No. 702 Receiving Set is characterized by exceptional quality of design and materials, volume and clarity of tone, simplicity of control, selective tuning, and no distortion.

This set includes the following Standard Bestone Apparatus:—

Moulded vario-coupler, controlled by two inductance switches and switch points

Rheostat

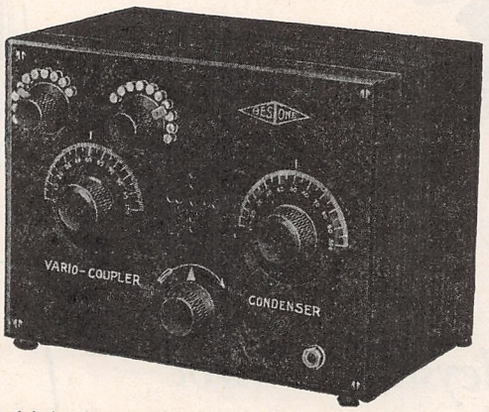
V. T. Socket

Variable Condenser

Two Circuit Jack

Two Bakelite dials—all mounted on Bakelite bevelled panel, machine engraved.

The cabinet is mahogany finished, equipped with hinged top, so that the interior is readily accessible.



Rubber bumpers prevent scratching of surface upon which the set is placed.

Wave length—600 Metres.

Dimensions —11⅛" long x 7" high x 6½" deep.

List Price —$35.

Equipped with 2200 Ohm Bestone Headset—$42.50.

We manufacture many types of Crystal and Vacuum Tube Receiving Sets at prices ranging from $22.50 to $125.

Order From Your Dealer

Bestone Radio Sets are handled by the best Radio Dealers everywhere. If you can not obtain a Bestone demonstration from your dealer, write us direct—we will gladly send you illustrated catalog "N" and full information.

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Very many Dealers have been agreeably surprised to find that they are paying a large part of their overhead expenses by securing subscriptions to **Practical Electrics, Science and Invention** and **Radio News.**

There are many thousands of subscribers to these magazines, some of them regular patrons of yours, who will wish to renew their subscriptions during the winter months.

It would be good business on your part and a decided convenience to your patrons if they could leave their subscriptions with you.

We pay a very liberal commission and will send you sample magazines and subscription forms.

For details write to **C. J. Wolfe**

EXPERIMENTER PUBLISHING COMPANY, Inc.
53 Park Place, New York

mentary electricity, principles underlying radio communication, care and use of storage batteries, care and use of radio equipment, construction and maintenance of field telephone apparatus, and similar subjects. Code classes were also held each day, and after several days' training several field radio sets and a small field telephone system were put into use. At about this time the students were divided between the radio and telephone work, according to which they preferred and showed the most ability in.

The most interesting part of the training was a three-day sham battle held at the beginning of the last week in camp. All drilling and school were discontinued at the beginning of the "battle." Several other organizations other than the Signal Corps engaged in it. The Signal Corps operated five field radio stations, two message centers, and a field telephone system. Most of the conditions were like those in actual warfare, but there was one great difference, that communication was carried on only one and a half hours per day. All apparatus was taken to the field and set up each day, and again taken down and returned to the camp, so there was about five hours' work per day.

The usual daily schedule was, the first half of the morning drilling, the second half of the morning school, and a short meeting early in the afternoon. The men usually had most of the afternoon and all of the evening to themselves.

The work described above is only one side of camp life. There are many amusements and sports there, and a dance was held every Saturday night at Louisville, with special trains at low rates. The sports in camp included a boxing tournament, track meet, etc.

Applicants for the 1923 C. M. T. C. who have not had previous military training must be between the ages of 17 and 25, and those with previous training will be admitted up to the age of 27. Further information about the 1923 camp may be obtained from the headquarters of any Army Corps Area, or any recruiting office.

Contributed by VICTOR ANDREW,
Wooster, Ohio.

REPORTING BY RADIO

In newspaper language, radio "scooped the world" in reporting the million-dollar fire which gutted one of the principal business blocks in Atlanta, Ga., and threatened to wipe out the entire business section of the city.

A broadcasting station a block from the scene of the blaze interrupted its musical program to send out bulletins on the progress of the fire. The proximity of the fire to the studio permitted the announcer to tell of the fire as he saw it, without even the necessity of relaying the news by telephone. Listeners in a radius of nearly 2,000 miles knew of each gain of the flames almost as quickly as if they had been in Atlanta looking on.

The fire broke out a few minutes before midnight on a Saturday, just as the newspaper editors of the country were busy getting their Sunday morning editions to press. It was too late for most of them to wait for the reports of the fire to come through the regular news channels, but with the radio reports available the fire could be covered as promptly as if it were burning under their own windows. Scores went to press with the radio bulletins, while competitors, who depended on the telegraphic reports, did not carry the fire story until the following day.

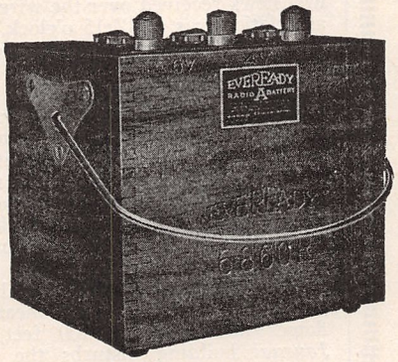
This was probably the first time in history that an important news event was reported to the entire country simultaneously with its occurrence.

Radio also did service in fighting the fire by bringing to their posts numbers of firemen off duty at the time, who happened to hear the radio fire reports. In thanking the broadcasting station for its assistance, Fire Chief William Cody of Atlanta stated

FOR BETTER RESULTS USE

EVEREADY

"A" and "B" BATTERIES WITH YOUR RADIO SET



EVEREADY "A" BATTERIES

No. 6810 - 50 Amp. Hrs. - $15.00
No. 6860 - 90 Amp. Hrs. - 18.00
No. 6880 - 110 Amp. Hrs. - 20.00

Hardwood Box, Mahogany Finish—Convenient Handle, Nickel Plated—Rubber Feet, Protect the Table

Cannot Be Accidentally Short-Circuited

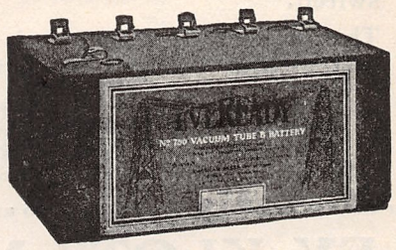
All Eveready "A" batteries are equipped with a 4 volt as well as a 6 volt terminal, making it possible to use either 6 volt or 4 volt vacuum tubes in your set.

EVEREADY "B" BATTERIES

Guaranteed to Be Absolutely Noiseless

No. 766 is the most popular size, and its use is recommended by most radio engineers and by experienced operators. The larger size of its 15 cells result in a much longer life, which far outbalances its increased cost over our No. 763. We strongly recommend the use of this No. 766 where ultimate economy is the important consideration. It is equipped with Fahnestock Spring Clip Binding Posts, giving variable voltages from 16½ to 22½ in 1½ volt steps. Dimensions: length 6⅝"; width 4"; height 3"; weight 3 lbs. 7 oz.

Price, $3.00



No. 763

Contains 15 cells of small size and enclosed in waterproof cardboard box. It is equipped with five brass strip positive taps ranging from 16½ to 22½ volts in 1½ volt steps, which covers the requirements of all present day soft detector tubes. Because of its limited capacity, due to its small cells, this battery is recommended for use only where light weight and small space are essential. Dimensions: length 3⅜"; width 2"; height 2½"; weight 13 oz.

Price $1.75

No. 767

Contains 30 cells of the same size as in No. 766. This battery was designed especially for use in connection with vacuum tube receiving sets employing a detector and one or more stages of amplification. In reality it is two No. 766's in one box. It therefore has the same desirable characteristics of economy and long life as the No. 766, and is recommended for use wherever 45 volts is required. It is provided with five positive taps ranging from 16½ to 22½ volts for detector tube control, and a 45 volt tap for the amplifier tubes. All terminals are of the Fahnestock Spring Clip Binding Post type. Dimensions: length 8"; width 6⅝"; height 3"; weight 9 lbs.

Price $5.50

No. 746

Contains 72 cells of the same size as in No. 766, and gives a maximum voltage of 108. It is equipped with Fahnestock Spring Clip Binding Posts giving following voltages: 16½, 18, 19½, 21, 22½, 45, 108. This type of battery is frequently used in connection with loud speaking devices requiring high amplification. With the above arrangements of taps, it is possible to use the same battery to operate not only the loud speaker, but the radio receiving set as well. These taps also make this an ideal battery for those who wish to experiment with a Super-Regenerative Circuit. The battery is assembled in a wooden box of neat appearance and sturdy construction. Dimensions: length 17"; width 9"; height 3½"; weight 20 lbs.

Price $15.00

Columbia Ignitor Six-Inch Dry Cells equipped with Fahnestock Connectors

Columbia Dry Cells are suitable for the filament or "A" circuit of Westinghouse WD-11 Vacuum Tubes, which require one six-inch dry cell per tube

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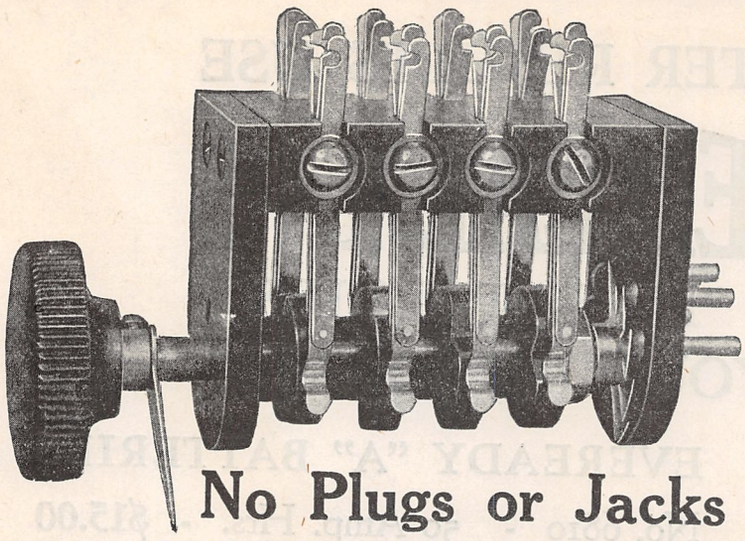

No Plugs or Jacks

Needed When You Use the

ARKAY UNIVERSAL CAM SWITCH

The ARKAY Cam Switch insures positive and instantaneous control of detector and amplifier circuits under ONE KNOB.

Universal in operation. Provides for filament control of vacuum tubes. Valuable as a short- and long-wave change switch or a send-receive switch.

The ARKAY Cam Switch is a beautifully built instrument, up to the high Arkay standards.

Sold By Retailers Everywhere **Price $5** *Leading Jobbers Feature It*

Packed one in a box with Knob, Pointer and Mounting Screw

At your dealers or sent by us postpaid to any point in the United States.

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Also Makers of Arkay Loud-Speaker Radio Horns, Crystal Detectors, Vernier Adjusters, Phonograph Attachments, Variable Condensers

that he was strongly advocating that all firemen have receiving sets installed in their homes in anticipation of similar emergencies in the future. In Atlanta and vicinity, many hundreds who were listening in heard of the fire, and in an hour every down-town street was teeming with people, although it was well past midnight.

The feat of reporting the fire half an hour to an hour ahead of the news services that distribute their reports by telegraph has attracted the nation-wide attention from the newspapers, many of which carried editorial and first-page comments.

The *Kansas City Star* said, in part:

"While a big fire was in progress in Atlanta, Ga., last night, *The Journal* was sending through the air 'up-to-the-minute' bulletins on the progress of the blaze.

"The bulletins were received by several sets in Kansas City at 11:50 o'clock. The first news received over the wires of a news association was at 12:15 o'clock, and details were far in arrears of those picked out of the air.

"From a loud speaker in the Automobile Club came the voice of the announcer of the *Atlanta Journal* with the information:

"'Atlanta is threatened with its most disastrous fire. At present we do not feel the *Journal* building is threatened and will endeavor to carry through the radio program.'

"After an orchestra program, this was added:

"'The flames are bright and light up the studio like sunshine. The heat from the flames that now rise 100 feet above the *Journal* building disturbs the performers in the studio here. The streets are filling with people.'

"The third and final bulletin was received about 12:30 o'clock this morning. It told that an entire block in Whitehall Street was under destruction and the flames were spreading. A fight would be made near the railroad tracks that separate the business from the residential district. Then the announcer said:

"'We must sign off. The city is at the fire. We can operate no longer.'"

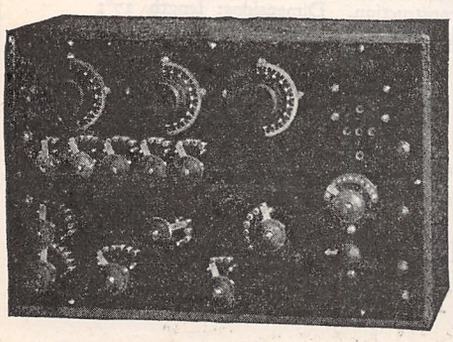
The *Philadelphia Inquirer* said:

"The possibilities of the radio telephone as a news gathering agency were demonstrated in a dramatic manner early yesterday morning when *The Inquirer* was the first newspaper in this city to receive word of the disastrous fire which swept the business district of Atlanta, Ga.

"The information came from the broadcasting station known as WSB, operated by the *Atlanta Journal* and located in that newspaper's building. The news, announced by the speaking voice rather than by the more conventional medium of the telegraph

LISTENING TO THE WORLD'S GRAND OPERA

With TRESCO TUNERS—"If you don't buy a 'Regenerative Tuner' licensed—you will not have a Tuner"



DE LUXE TYPE AMPLIFIER TO SUIT $35.00

TRESCO SUPER-UNIVERSAL REGENERATIVE TUNER

Cabinet 12 x 17½ inches. Formica or Hard Rubber Panel. Weight, 15 lbs.; shipping 25 lbs. Wave length range, 150-25,000 M. Tuners inside—three, AS, BS, RS. Recommended by users of the Bureau of Market Reports and guaranteed to get all the wireless signals, either CW, spark, or telephone within the range of the sending station. This is the only tuner in the world that has this range of wave lengths and gets the signals on the smallest possible single wire aerial. Arlington time, Annapolis, San Diego signals clearly read through even a violent thunder storm. Nearly all stations in the United States of the Bureau of Markets come in on this tuner in the center of the United States, and no point in the country would prevent the reception of these signals. It is recommended for the Farmer, Bureau of Markets, Schools, Colleges, etc. There is nothing about it to get out of order or need replacing except the high voltage batteries, a replacement of which costs only a few dollars. We ship only by express. We do not ship without testing and calibrating with bulb, and each one is absolutely guaranteed to do just as we claim or we will refund your money. You do not need to know anything about wireless to operate this tuner or to get the signals and telephone reports. Cabinet is highly polished and all parts nickel finish. If you wish extra loud signals you may use one or two step amplifier, as posts are provided on the tuner for this purpose. It is complete with all that is needed except a pair of phones and a few dry cells to light the filament of the Audion. Ready to use when it arrives with full directions so that a child can operate it. Priced at $125.00, F. O. B. factory. Detector, $5.00 extra.

Licensed under Armstrong U. S. Patent No. 1113149 **CIRCULAR FREE**

TRESCO—DAVENPORT—IOWA

Box 148

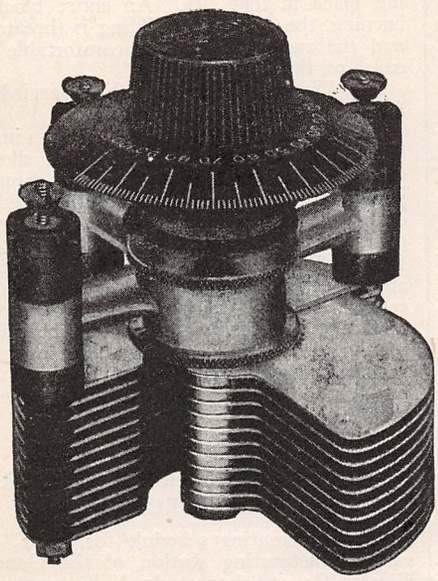
What's in the Name Cotoco?

TRADE MARK REG. U. S. PAT. OFF.

Radio Supplies Made for Better Results

Designed by an organization of Electrical and Mechanical Experts. Made to supply the needs of those amateurs and professionals in radio who know and demand the best. You will find Cotoco Products displayed by those wiser dealers who are building permanent business on radio supplies that give maximum results and by keeping abreast of the latest developments in radio—namely, radio frequency and loop aerials.

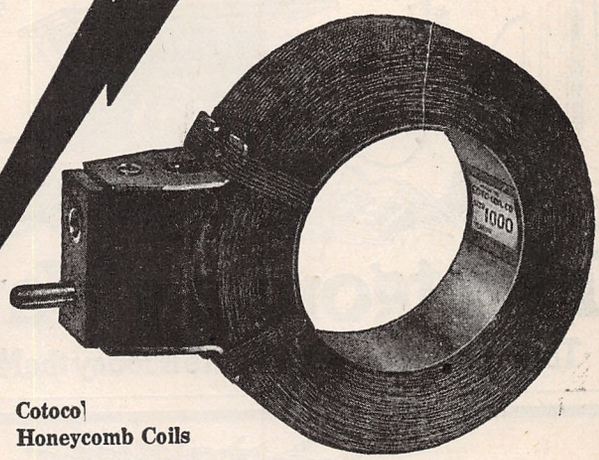
Designed for Electrical Efficiency and Made a Fine Machine Product



Cotoco Variable Air Condensers are scientifically correct to minimize electrical losses. We have tested many condensers, but have never found their equal. Works just as smoothly as a fine watch, because it's made as well.

You can tell by its looks alone that it is a precise instrument

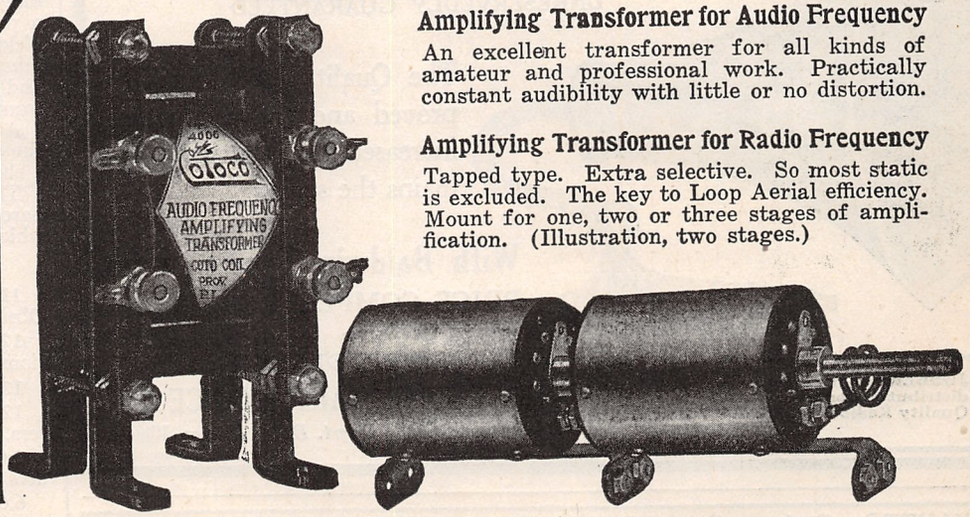
We were the first to make Honeycomb Coils. Here is your compact, economical inductance. Mounts on fixed or trunnion brackets.



Cotoco Honeycomb Coils

Static and Distortion Defeated Loop Aerials Available to All

Beyond our most sanguine expectations, we have succeeded in overcoming Static and securing great range with Loop Aerials. Distortion in headphones or loud speaker is practically unknown with a Cotoco built set. Write for connection diagram.



Amplifying Transformer for Audio Frequency

An excellent transformer for all kinds of amateur and professional work. Practically constant audibility with little or no distortion.

Amplifying Transformer for Radio Frequency

Tapped type. Extra selective. So most static is excluded. The key to Loop Aerial efficiency. Mount for one, two or three stages of amplification. (Illustration, two stages.)

If Your Dealer Cannot Supply You

Write us his name and address. We will see that you are supplied with

FREE

Connection Diagrams for Loop Aerial Sets

using either two or three stages of Radio Frequency Amplification.

COTO-COIL CO.

87 Willard Ave., Providence, R. I.

Radio

The Greatest Radio Offer of the Year—Absolutely Complete, $49.50

This special receiving outfit will give as good results as any outfit of this improved type on the market. It is absolutely complete, there is nothing extra to buy. We include everything—you simply put up the aerial, connect the instruments, which is easy to do, and in less than half an hour you can be receiving signals, radio music, lectures, stock reports, market reports, or any other radio program sent out.

In making tests with this set in Chicago we regularly heard Detroit, Pittsburgh and other stations were often tuned in. Of course, atmospheric conditions affect the range of this or any other receiving set made.

Highest Development in Radio Receiving

This outfit will equal in results any outfit of this type regardless of price. It is especially made for us and has behind it the fifty year old guarantee of Montgomery Ward & Co.: "Satisfaction guaranteed or your money back." You take no risk whatever in ordering this set.

Long Distance Vacuum Tube Receiving Set

The complete outfit includes our special Combined Tuner and Detector; Special 2000 ohm Double Head Set; Radio Storage Battery; one Detector Tube, one "B" Battery; and complete antenna and connecting equipment including 150 feet bare copper wire and 25 feet insulated wire, porcelain tube; double throw switch; 2 antenna insulators; lightning protector; ground clamp, 2 screw eyes and 25 feet of wire for instrument connections.

Order this set at our risk. It will be packed carefully and shipped immediately from our nearest house. Shipping weight 40 pounds.

563Z599—Complete Outfit..... **$49.50**

Order this outfit today and start at once enjoying in your home the most marvelous invention of the age.

Price of receiving Set without batteries, head piece, switch and aerial, shipping weight 8 pounds: 563Z598—$27.50.

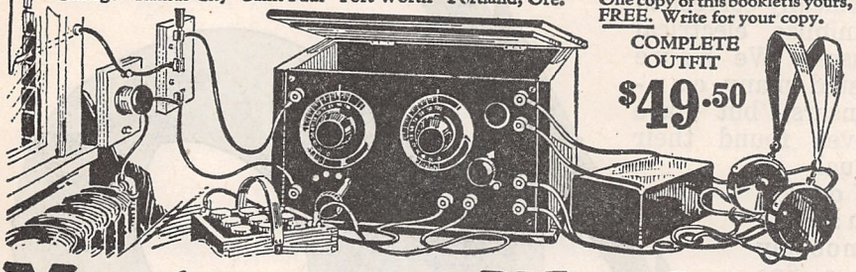
Send money order or check to the one of our five houses that is nearest to you.

MONTGOMERY WARD & CO., Dept. 2-R
Chicago Kansas City Saint Paul Fort Worth Portland, Ore.

RADIO CATALOG FREE

This FREE catalog tells you the kind of Wireless Equipment to own, so that you receive in your own home all the latest news, music, Church services, lectures—everything that is broadcasted. Everyhome should haveawireless telephone outfit. We now offer complete outfits from $12.95 up. Everyone interested in radio should see our low prices on parts and accessories. Write for this book. Learn about the miracle invention of the age. Easy to install, simple to operate.

One copy of this booklet is yours, FREE. Write for your copy.



COMPLETE OUTFIT **$49.50**

Montgomery Ward & Co.

The Oldest Mail Order House is Today the Most Progressive

TELMACO

TELMACOPHONE

The Metal Horn Without the Metallic Sound

CORRECTLY DESIGNED FAIRLY PRICED
UNRESERVEDLY GUARANTEED

The Quality has been improved and the production increased but the price remains the same.

With Baldwin Type C. Unit
PRICE COMPLETE - $20.00

JOBBERS AND DEALERS: We are also distributors for several manufacturers of Quality Radio Apparatus. Write for our catalog.

RADIO DIVISION
TELEPHONE MAINTENANCE CO.
20 So. Wells St. *Dept. B,* Chicago, Illinois

WANTED: Back numbers of RADIO NEWS, Sept., Oct., Nov. and Dec., 1921, Jan. and Feb., 1922. Experimenter Pub. Co., Inc., 53 Park Place, New York City.

instrument, came floating through the air, a distance of approximately 760 miles. A number of bulletins were sent out, the broadcasters sticking to their task until driven from their instruments by the heat of the flames raging on all sides of them."

The Commercial-Tribune of Cincinnati, Ohio, said:

"First news of the great fire that swept Atlanta's business district early yesterday morning was flashed to Cincinnati by radio. When the fire broke out in Atlanta, the operator began sending bulletins of its progress between the numbers of the regular program. As the fire gained headway, he signified his intention of 'standing by' with additional bulletins and continued sending reports on the fire as it swept on from one building to another, and was getting nearer and nearer to the *Journal* building, for the operator said he 'would tell the whole ether' it was getting hot. 'WSB signing off,' he said finally after sending out a report at 2 o'clock, 'Can't stand the heat any longer.'"

The Courant of Hartford, Conn., "covered" the fire with the following last-minute bulletin:

"At 2:15 o'clock this morning, radio station WSB, the *Atlanta Journal,* at Atlanta, Ga., broadcasted news of a terrific fire taking place in that city. An entire block is burning, the *Journal's* building is threatened and the radio studio is uncomfortable because of the flames nearby."

The Times of Frankfort, Ind., carried the following in its fire story:

"As one of the most disastrous fires in the history of Atlanta, Ga., broke out shortly after 11:30 o'clock Saturday night, Sunday papers went to press without even mention of one of the worst fires in the history of the south. However, the members of the family of Walter Campbell knew practically all the details of the great fire before they retired, having heard the reports broadcasted by the sending station in the offices of the *Atlanta Journal* until the operator reported the fire within one block of the building and too hot to remain inside to make further reports."

NEW PROGRAM SCHEDULE FOR WGY EFFECTIVE

A new operating schedule for WGY, the radio broadcasting station of the General Electric Co. at Schenectady, N. Y., went into effect recently. This station is now operating on a four-night a week schedule which calls for entertainments Monday, Tuesday, Thursday and Friday nights. One evening will be devoted to dramatic productions, another to opera, the third to a semi-classical musical program and the fourth to popular music.

An added feature of the WGY schedule, daily except Saturday and Sunday, will be a program every afternoon from 2 to 2.30 o'clock, Eastern standard time. This program is put on especially for the housewife and will include short talks of interest to women.

At the conclusion of the daily reading of the stock market quotations at 12.30 p. m., a short musical program will also be offered.

The complete daily schedule of WGY, prepared on a basis of Eastern standard time which became effective September 11, follows:

MONDAYS

11.55 a. m. to 12.00 noon—U. S. Naval Observatory time signals.

12.30 p. m.—Noon stock market quotations.

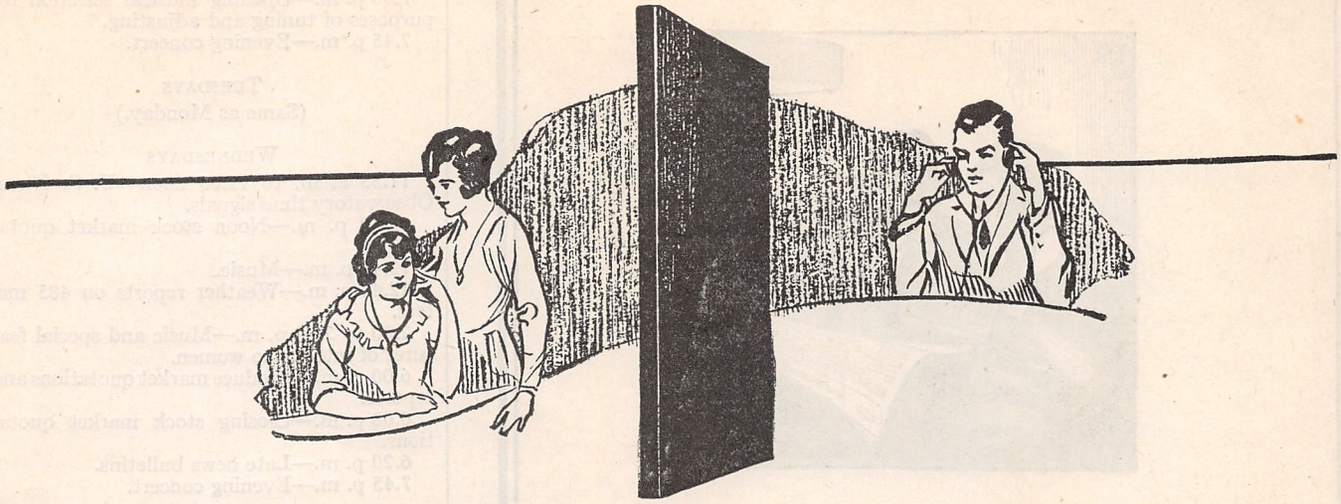
12.40 p. m.—Music.

12.45 p. m.—Weather reports on 485 meters.

2.00 to 2.30 p. m.—Music and special features of interest to women.

6.00 p. m.—Produce market quotations and reports.

6.08 p. m.—Closing stock market quotations.



Buy FORMICA *Radio Panels*

Because they look better.
Because they work more easily.
Because they have the highest dielectric strength.
Because they defy moisture, and do not warp.
Because their uniformity is remarkable.
Because they are approved by the navy and signal corps.
Because radio men everywhere have come to prefer them.

Your dealer has Formica or can get it. We can refer him to a wholesale stock in his locality. Our own large capacity makes immediate delivery possible.

DEALERS: A stock of Formica carries with it important advertising and sales cooperation. The demand for Formica quickly clears your shelves.

THE FORMICA INSULATION COMPANY
4618 Spring Grove Ave.
Cincinnati, Ohio

SALES OFFICES

50 Church Street....New York, N. Y.
9 South Clinton Street..Chicago, Ill.
415 Ohio Building.....Toledo, Ohio
414 Finance Bldg.....Cleveland, Ohio
1042 Granite Bldg.....Rochester, N. Y.
313 Title Building.....Baltimore, Md.
422 First Avenue.....Pittsburg, Pa.
1210 Arch Street....Philadelphia, Pa.
Sheldon Building San Francisco, Cal.

FORMICA
A Laminated Phenolic Condensation Product
SHEETS TUBES RODS

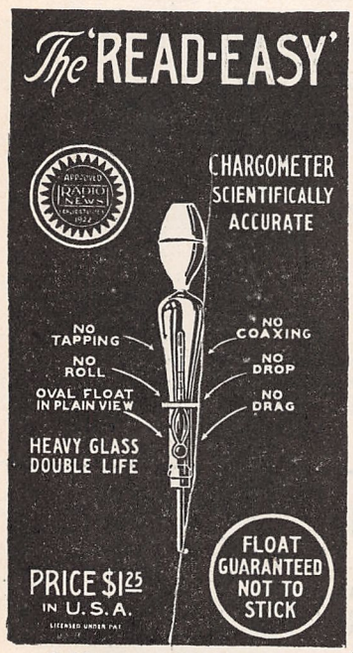
When the Seals Come, Buy Them

A LITTLE before Christmas, you will be offered some Christmas Seals. Keep them and use them on envelopes and packages. Send a check or money order to cover the small sum they cost.

When you do this, you help in the fight against tuberculosis. You help save human lives. Your help goes where help is most needed —to the house that is clouded with the threat of death. When the seals come, buy them.

Stamp Out Tuberculosis with Christmas Seals

THE NATIONAL, STATE, AND LOCAL TUBERCULOSIS ASSOCIATIONS OF THE UNITED STATES



Sold on a strict Guarantee
Adopted by Leading Battery Manufacturers

GET *ACCURATE* BATTERY READINGS

DON'T RUIN YOUR BATTERY BY USING INACCURATE

BATTERY TESTERS

THE READ-EASY INSURES ACCURACY

Frequent inspection is your only insurance against heavy repair bills, loss of time and untold inconvenience. But a test tells you nothing unless your readings are absolutely accurate. Know the truth about your battery. Read-Easy will tell. Order yours today.

No Spilling or Splashing of Acid
A Protection for Your Clothing and Rugs

DEALERS AND JOBBERS—Our proposition means quick turn-over and volume sales. Our attractive counter display moves our goods off the dealers' shelves. We can give immediate delivery now in quantity lots.

Read-Easy is a quality, precision product. Handle the best hydrometer and you'll sell the most.

ALA MANUFACTURING CO.

Radio Dept. No. 12

401 to 419 S. Sangamon Street Chicago, Ill.

RADIO OWNERS—If your dealer can't supply you, send $1.25 direct to us and we will send at once parcel post prepaid insured.

6.20 p. m.—Late news bulletins.
7.40 p. m.—Opening musical selection for purposes of tuning and adjusting.
7.45 p. m.—Evening concert.

TUESDAYS
(Same as Monday.)

WEDNESDAYS
11.55 a. m. to 12.00 noon—U. S. Naval Observatory time signals.
12.30 p. m.—Noon stock market quotations.
12.40 p. m.—Music.
12.45 p. m.—Weather reports on 485 meters.
2.00 to 2.30 p. m.—Music and special features of interest to women.
6.00 p. m.—Produce market quotations and reports.
6.08 p. m.—Closing stock market quotations.
6.20 p. m.—Late news bulletins.
7.45 p. m.—Evening concert.

THURSDAYS
(Same as Monday and Tuesday.)

FRIDAYS
11.55 a. m. to 12.00 noon—U. S. Naval Observatory time signals.
12.30 p. m.—Noon stock market quotations.
12.40 p. m.—Music.
12.45 p. m.—Weather report on 485 meters.
2.00 to 2.30 p. m.—Music and special features of interest to women.
6.00 p. m.—Produce market quotations and reports.
6.08 p. m.—Closing stock market quotations.
6.20 p. m.—Late news bulletin.
6.30 p. m.—Story for the children.
7.38 p. m.—Musical selection for the purpose of tuning and adjusting.
7.40 p. m.—Health talk by Dr. Herman M. Biggs, New York State Health Department.
7.45 p. m.—Musical program. (Lasting from one to one and a half hours.)
10.28 p. m.—Musical selection for the purpose of tuning and adjusting.
10.30 p. m.—Musical program. (Lasting one hour.)

SATURDAYS
12.30 p. m.—Closing stock market quotations.

CALIFORNIA LEADS IN BROADCASTING STATIONS—SERVICE CONTINUES IN ALL BUT ONE STATE

Broadcasting still continues in all but one state in spite of the pessimistic reports from some quarters that this service, which is likened to a fad, is falling off and likely to collapse. On September 21, there were 510 active broadcasting stations, according to a survey by the Radio Section of its Limited Commercial Stations, operating on 360 meters.

California still leads the procession, with 66 stations sending entertainment, news and information; Ohio is second with 34; and New York third, having 28 stations, while Wyoming brings up the rear without a single station. Every other State of the Union has one or more transmitting stations carrying entertainment in some form for the owners of receiving sets.

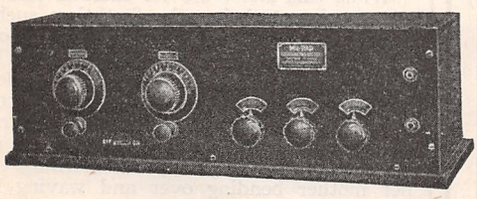
NUMBER OF BROADCASTING STATIONS BY STATES ON SEPTEMBER 21, 1922

California	66
Ohio	34
New York	28
Pennsylvania	27
Texas	25
Washington	23
Missouri	22
Illinois	20
Iowa	20
Nebraska	17

ACT 2 FROM OPERA "PAGLIACCI"

The New Star in the Radio World

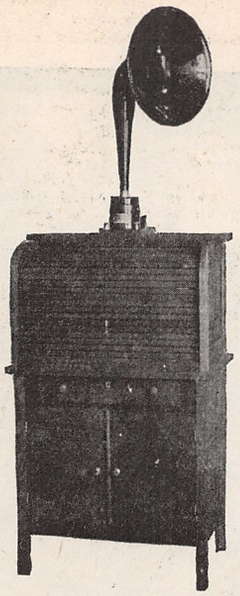
GREATNESS is courageous. It dares to leave the beaten path and travel by strange routes to discover a better thing. Filled with the courage which comes of high intelligence and lofty aspirations, radio engineers of the Mu-Rad Laboratories have brought to final perfection marvelously improved apparatus. This superiority is gained at no additional cost to the radio public. The supreme Christmas gift, a Mu-Rad Set. Literature upon request.



MU-RAD
LABORATORIES
INCORPORATED
ASBURY PARK
NEW JERSEY

We Are Manufacturers of Fine Radio Furniture

A Radio Desk De Luxe—the last word in Radio Furniture. A place in which to lock up your Cabinet. A drawer with lock, for your tubes, headset, etc. A Cabinet for concealing storage battery, "B" batteries and rectifier. A broad place on top for loud-speaker.



SPECIFICATIONS:

Hardwood, rubbed mahogany or dark golden-oak finish. Roll top with lock. Height over all 40 inches. Upper Cabinet: 12x12x22 inches. Drawer: 17x9x2 inches. Battery Cabinet: 21x14x13 inches.

PRICES:

Express paid east of Mississippi River $25.00
Express paid west to Rocky Mt. States 27.50
Express paid to Rocky Mt. and Pacific States 30.00

CASH WITH ORDER

RADIO TABLES

Handsome Hardwood, hand rubbed, mahogany or golden-oak finish. Ample space for Cabinet on table. Plenty of space for concealing all batteries and rectifier. A beautiful piece of furniture for the home.

Shipped, charges paid, to points east of Mississippi River, west of Mississippi River, add $1.00 to either size.

14¾x24x26 inches high $12.00
16½x26x26 inches high 15.00

CASH WITH ORDER

RADIO CABINETS.

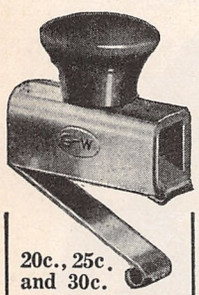
Hardwood, hand rubbed, mahogany finish. Hinged top, front rabetted for panel. Sent postpaid. *Send for List.*

THE SOUTHERN TOY COMPANY
HICKORY, NORTH CAROLINA

Build a Radio Xmas Gift

Easy to Make a Fine Set If You Use G-W Parts

G-W Products work the most efficiently because they're made so very accurately. Neat design, beautiful finish—the best parts you can put into any set and the least expensive in the long run. Insist on the G-W trade-mark. You'll be proud to give a set made of these parts. Known and used all over America.



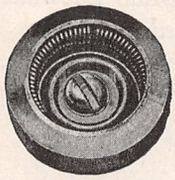
20c., 25c. and 30c.
G-W Slider
The most popular slider in America. Slides easier, cannot damage coil, perfect contact at every point. Clean-cut, workmanlike appearance. Two highly polished finishes—nickel and brass. Two sizes—¼ and 5/16 inch.

G-W Crystal Detector
Spring grip crystal cup. Crystal removed and inserted in a second without use of screws. Cone-shaped spring counteracts vibration. Friction ball makes positive adjustment easy. Fine appearance..... $1.25

G-W 2 Slide Turner
Wires accurately spaced. Tube impregnated with special insulating material. Wires cannot loosen. $3.50

Send for circular containing International Code and Table of Symbols.

Reliable Dealers Sell G-W Products Sent Direct, If Your Dealer Has None.



G-W Spring Grip Crystal Cup
A new and greatly improved cup. Crystal inserted and removed with the fingers in a second. Perfect contact. Nothing to loosen or get out of order. Fits any base. **25c.**

GEHMAN & WEINERT
42 Walnut Street, Newark, New Jersey

WANTED: Back numbers of Radio News, Sept., Oct., Nov. and Dec., 1921; Jan. and Feb., 1922.
EXPERIMENTER PUBLISHING CO., Inc., 53 Park Place, New York City

Oregon	15
Kansas	15
Minnesota	12
Indiana	12
Massachusetts	12
Michigan	11
New Jersey	11
Louisiana	10
Wisconsin	10
Florida	9
Dist. of Columbia	8
Oklahoma	8
Georgia	7
Arkansas	6
Colorado	6
Arizona	5
Connecticut	5
Idaho	5
Rhode Island	5
West Virginia	5
Alabama	4
Maine	4
Utah	4
Kentucky	4
Montana	4
Maryland	3
North Carolina	3
South Dakota	3
Tennessee	3
Nevada	2
New Mexico	2
North Dakota	2
Porto Rico	2
South Carolina	2
Hawaii	2
Vermont	2
Virginia	2
Delaware	1
Mississippi	1
New Hampshire	1
Wyoming	0
Total	510

CLASS B APPLICATION

Several applications from larger broadcasting stations for the Class B License, permitting the use of the 400-meter wave, have been received by the Department of Commerce, but to date only two have been authorized to transmit on this wave. They are The St. Louis Post Dispatch and the Westinghouse Station at Chicago. The officials in charge of the licensing of radio stations do not anticipate that more than a dozen applications for the Class B license will be received, as only the most powerful stations carrying high-class entertainment regularly can hope to qualify.

PHYSICAL CULTURE BY RADIO

Setting-up exercises by Radio, beginning at 7 o'clock each morning, is the latest use to which the Radio has been put. On September 5, a series of Weight Reducing and Weight Gaining Exercises for various members of the family was inaugurated and broadcasted from the Amrad Station "WGI" at Medford Hillside, Mass., as a regular feature of its program.

The object of this course is to place at the disposal of all radio users the most approved methods of securing physical efficiency. Three exercise classes lasting 15 minutes each are held every morning. These personal efficiency courses are in charge of Arthur E. Baird, Head of the Department of Physiotherapy, at Caines College of Physical Culture.

While this latest use for radio is entirely an experiment, being the first time such a course has ever been attempted by radio,—in fact, the first time a radio broadcast has been given at this hour of the day—reports indicate that the exercises are being tried by people all over the New England District. One young lady wrote in that the little girl of the house, arising early one morning, saw her mother bending over and waving her arms with the telephone receivers on her head. She was so frightened, because she didn't know what her mother was doing, that she notified the neighbors.

The three sets of exercises are graded as follows: The first for the normal business

A big part of the enjoyment of Radio is in the assembling of your own set. Besides, when you do this, you cannot help but learn, and more quickly, the facts you need to know for better Radio receiving.

Install Kellogg dependable, high quality, radio parts in your set; for instance, a Kellogg variable condenser with vernier. With this piece of apparatus, accurate and careful tuning is assured. Kellogg variable condensers are a very important and necessary equipment in accurate selecting of various broadcasting stations.

With the condenser, get a Kellogg Bakelite molded variometer which can be assembled as a variocoupler, if desired, according to the circuit.

Also three Kellogg dials. These likewise are an exceptional product. They come in four inch and three inch diameter, and are finished on both sides with bushings which allow of attachment to shaft of various dimensions.

We do not believe there is a better tube socket than the Kellogg. Kellogg jacks are a standard product, and like Kellogg receivers and other parts, have been manufactured by this company steadily for over twenty-five years, assuring the product of highest value for the cost.

Who in your family is the Radio fan?

Have each member of the family give him one part, and don't forget to include a Kellogg head set which is the lightest on the market, and its design is based on standard receiver production of a most successful line of equipment.

If your dealer does not handle Kellogg, write us for our illustrated bulletins, and we would appreciate receiving his name and address.

KELLOGG SWITCHBOARD & SUPPLY CO.

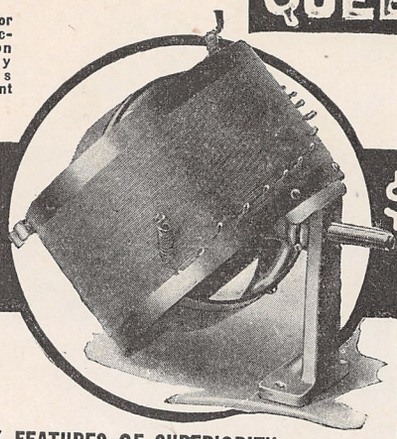
Main Offices and Factory: Chicago, Illinois

Builders of High Grade Telephone Equipment for Twenty-five Years

Broadcasting to you A Merry Christmas and Good Wishes

QUEENS Vario Coupler

Look for our inspection tag on every Queens instrument



$5 $5

REAL FACTS!

Queens instruments have been designed by men who have made radio their life work—beginning years before broadcasting. These men have put their radio brains and priceless experience behind the designing of Queens apparatus with the result that today there are no variocouplers or variometers quite so good at such a low price.

Don't be fooled by the fact that there are numerous other variocouplers and variometers on the market selling much cheaper—**they are inferior instruments and time has proved such.** During the wave of popularity that radio has just undergone, much very inferior apparatus has found its way to the dealers' shelves. This apparatus is now being sold for a song. **But don't be fooled by price. Insist on Queens for your protection!** If your dealer hasn't got them, order direct.

SIX FEATURES OF SUPERIORITY

The Queens Variocoupler has the following six features of superiority:

1. Rigid mechanical construction. Genuine black bakelite primary and secondary tubes. Aluminum casting for base or panel mounting. Special improved stop. All brass—nickel plated.
2. Extreme selectivity accomplished by setting primary and secondary at an angle so that shaft rotates through an arc of 180 degrees.
3. Primary and secondary wound with green Silk-covered wire. Primary is provided with seven single turn taps and seven multiple turn taps which permits tuning in steps of one turn.
4. Noiseless soldered pigtail connections to Fahnestock connectors. Nothing to scrape or wear.
5. Shaft is ¼ inch solid brass fitted in a long reamed bearing. This assures tight fit, smooth rotation and long life.
6. Queens inspection is your protection. Look for the inspection tag on every Queens instrument. The Queens Variometer matches the coupler in quality.

$5 $5

FREE: We have a very interesting leaflet on the Armstrong regenerative and super-regenerative circuits., Send for your copy, enclosing 2 cent stamp postage.

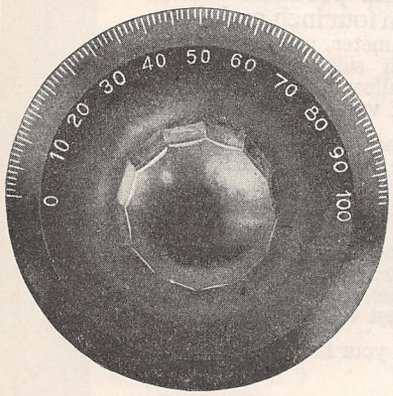
DEALERS: Write for our discounts and let us tell you more about ourselves and our instruments. We want you to know us.

QUEENS RADIO COMPANY, Inc.
12 Forest Street. Winfield, L. I.

Our inspection tag is your guarantee—Insist on Queens.

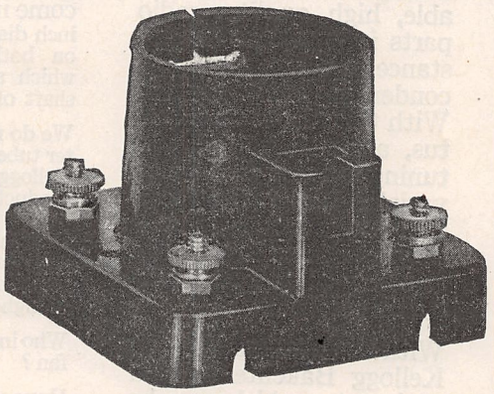
QUEENS Vario Meter

BELL MOULDED BAKELITE RADIO PARTS



Price, $1.00

Genuine Bakelite highly polished. Fine clear cut graduations and numerals.
Knob fits fingers perfectly and allows fine adjustment.
No corners to catch dust.
Moulded stops—Runs true.
3½" Dial.



Price, $1.25

Genuine Bakelite. Heavily nickeled phosphor bronze springs designed to make double electrical contact.
Adapted for panel or base mounting.
Reinforced T slot allowing use of sending or receiving tubes without adjustment.

Attractive Discounts to the Trade

Manufacturers of Moulded Insulation since 1911

BELL MANUFACTURING CO., 14 Elkins St., BOSTON, MASS.

RADIO MAILING LISTS

We have just compiled a correct mailing list of:

9,270 Retail Radio Dealers	per M.	$ 7.50
1,200 Radio Manufacturers	per List	10.00
1,350 Radio Supply Jobbers	per List	12.50
260 Radio Stations	per List	4.00
14,000 Radio Amateurs and Managers of Radio Stations	per M.	7.50

Typewritten and ready to send on receipt of remittance.

TRADE CIRCULAR ADDRESSING CO., 116 W. Adams St., Chicago, Ill.

VULCANIZED FIBRE

Be sure and specify "WILMINGTON FIBRE"

Sheets, Rods, Tubes, Washers, Etc., Specialties

Wilmington Fibre Specialty Co., Wilmington, Del.

Branch Offices "Everywhere"

man or woman who wishes merely a set of toning-up exercises; the second for those who are over-weight and wish to reduce; and the third for those who are under-weight and wish to build up. The exercises are accompanied by explanatory talks dealing with all phases of personal hygiene such as diet, bathing, recreation and the like.

ARMY AIR SERVICE BROADCASTS

Two stations of the Army Air Service have recently made decided hits with the radio fans in their respective neighborhoods by undertaking broadcasting on a small scale—"entering the newest field of indoor sports," they term this public service.

The 91st Observation Squadron, stationed at Eugene, Oregon, on Forest Fire Patrol duty, is using the radio station at its flying field during spare time to entertain neighbors within a good radius, and has met with marked success. There is no other station of any size in that locality broadcasting, so they are putting on a program chiefly of phonograph music and short talks on forest fire fighting and prevention, with occasional entertainment of other kinds. It is their intention to build a regular broadcasting room in order that they can carry music by a local orchestra. Great enthusiasm is said to be shown by local fans who listen in at home or attend the loud-speaker concerts held in the city park on special nights.

Brooks Field, at San Antonio, Texas, also has an "amateur" broadcasting station where the officers and men of the aerial squadrons put on a varied musical program. This created considerable interest in the surrounding territory, according to letters received by Lieutenant McGregor of the Field Communication Department. The Post jazz band, augmented by piano, saxophone and cornet solos, furnishes the latest music nightly, and the slogan "Own your own radiophone" has come to be very common thereabouts.

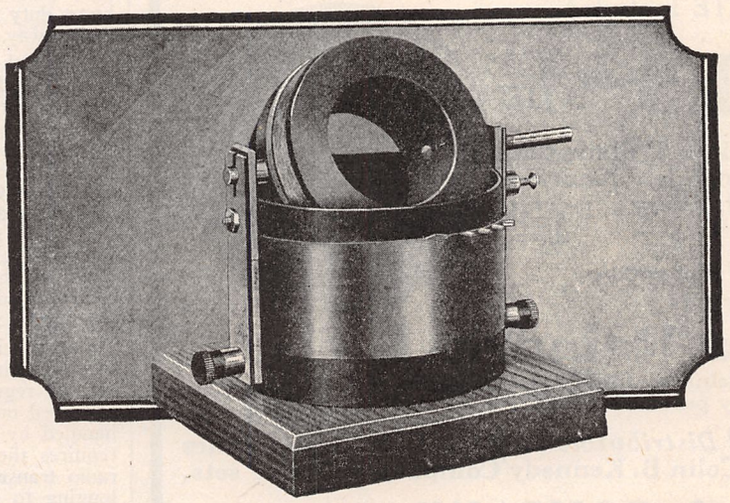
RADIO TANKS PLANNED FOR ARMY AND MARINE CORPS

Efforts to produce radio-controlled tanks appear to be the very latest step in Government radio work for the army and probably for the Marine Corps material. To date no definite plan has been evolved by radio engineering experts, but after the navy successfully operated the *Iowa* by radio control, the leading scientists of the army believe radio-controlled tanks are a certainty.

Today one out of every eight or ten army tanks has a radio transmitting and receiving set, enabling this leading or control tank to keep in close touch with headquarters constantly, and communicate by signals with its fellows in battle. Such efficient liaison would be a tremendous step in military science, as the tanks could also serve as message centers for the infantry troops as well as spot artillery fire, and keep headquarters posted as to the position of the advance lines. Before the year is out it is believed that all army tanks will be equipped with radio communicating outfits and that the Marine Corps will also have tanks equipped with radio. At the recent maneuvers at Gettysburg the marines used some army tanks, one of which was a "master tank" equipped with radio.

While the method of the radio-control of the battleship *Iowa* by the *Ohio* last summer during the bombing maneuvers has been carefully guarded, and the details of radio-controlled automobiles have never been revealed, it is understood that army radio experts have all the necessary principles well in hand and that the first radio-controlled tank will be christened before many months are passed; then American forces, if they are forced to take the field against an armed enemy, will have a modern and heretofore untried military weapon using no personnel. During the World War the tanks used did not even have radio communication, but signaled visually or reported by messengers or runners.

Thoro-bred
RADIO PRODUCTS



How to tune-in without the "birdies"

HISSING, sizzling and similar noises have been such a common experience of the radio amateur while tuning in that they have been nicknamed the "birdies." This nuisance can be eliminated. The Thoro-bred Vario-Coupler in addition to the usual service has the added feature of tuning in so closely that the "birdies" are driven away. Ordinary vario-couplers have a tap brought out for connection purposes only at every six or seven turns of the primary. The Thoro-bred Vario-Coupler has each of the first seven turns tapped one turn at a time and the balance of the primary tapped every seven turns. This close-tuning feature scares the "birdies" away. It also saves you the expense of a variable condenser.

Each tap on the primary has a 3″ lead insulated with cambric tubing. This permits making connections to contacts without using soldering iron. There is a directly positive connection to the secondary which eliminates all scratchy noises when in operation.

The Thoro-bred Vario-Coupler is molded. It is not subject to moisture as are the common wooden types. Distributive capacity is eliminated through the use of special green silk wire in both the primary and secondary. FOR ONLY FIVE DOLLARS you can now buy the Thoro-bred Vario-Coupler from your nearest radio or electrical store. If for some reason your dealer cannot supply you, send the money direct and a Thoro-bred Vario-Coupler will be mailed you parcel post prepaid.

THE MARSHALL-GERKEN CO.
TOLEDO, OHIO, U. S. A.

THE MARSHALL-GERKEN CO.
Toledo, Ohio, U. S. A.

My dealer was unable to supply me with a Thoro-bred Vario-Coupler. Please send me one, parcel post prepaid. I enclose five dollars.

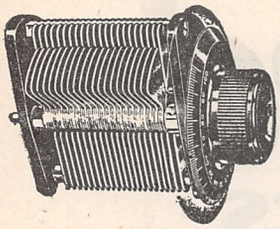
Name .....

Street .....

City .....

Dealer's Name .....

FESCO QUALITY CONDENSER

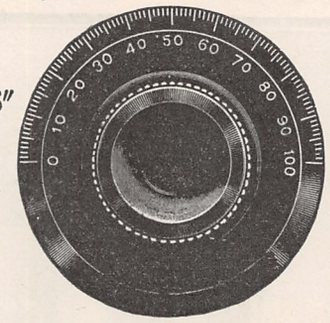


3 Plate	00004	Vernier $2.25
11 Plate	00025	3.25
23 Plate	0005	4.00
43 Plate	001	4.75
Dial with instrument		.75

Specifications

Genuine bakelite end plates, 3/4" hard aluminum plates. No spacing washers to accumulate error in fixed plate assembly. All conductor parts of brass, copper plated. CAPACITY SHIELD and TEMPLATE included.

1/4" – DIALS – 3/16"



Manufactured of bakelite. 3" diameter. Large distinctive numerals. Knurled knob. Highly polished. Very attractive appearance - - - $1.00=

Write for dealer's proposition in your territory

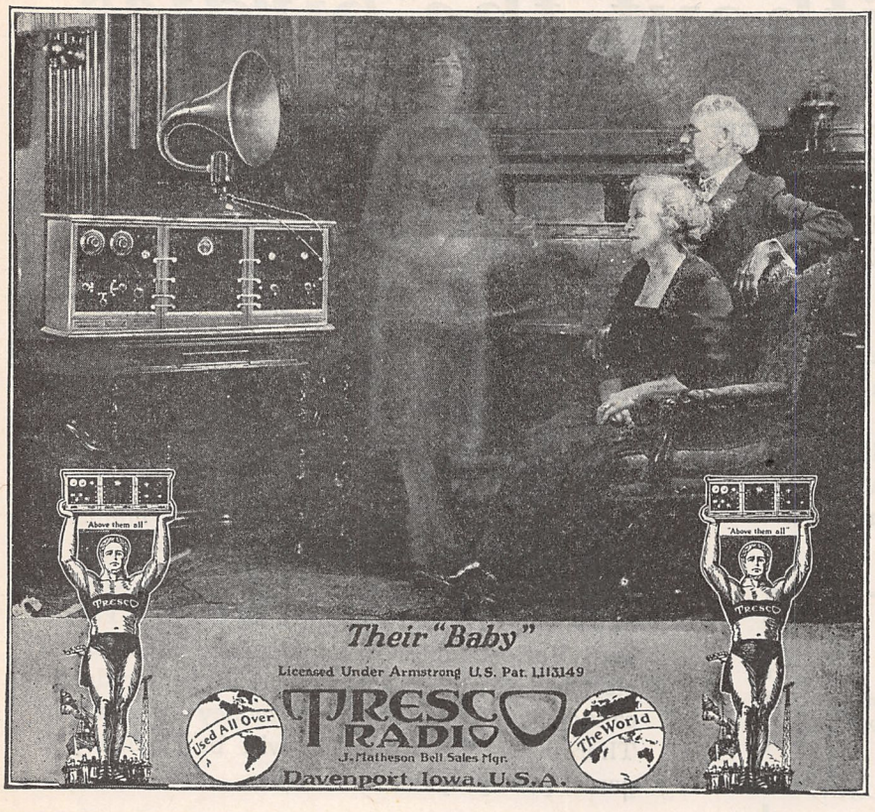
Genuine Reinartz Coils

Manufactured by John L. Reinartz. Fully guaranteed. Do not be misled by poor imitations. $2.00= each

Exclusive New England Distributors for Master-Baldwin Phones and Claraphones, and Colin B. Kennedy Company receiving sets.

STERN & COMPANY, INC.

306 ASYLUM STREET HARTFORD, CONN.



Edeson Radio Phones

Adjustable Diaphragm Clearance

We guarantee satisfaction, or your money refunded. The adjustment feature places our 'phones on a par with the world's greatest makes. Our sales plan eliminates dealer's profits and losses from bad accounts, hence the low price. Better phones cannot be made. Immediate deliveries. Double 3000 Ohm sets, $3.98; 1500 Ohm single set, $2.50. Circular free.

Edeson Phone Co., 6 Beach St., Dept. 25 Boston, Mass.

RADIO TOOL SET

Side Cutting Plier
Long Nose Plier
Two Screw Drivers
Electrician's Knife
Tweezer File
$4.00 in Bag
With Soldering Iron Kit $4.75
With Automatic Torch Outfit $6.00
Send Money Order

CEB CO., 98 Park Place, New York City

SCOPE OF GOVERNMENT RADIO CONTROL

The Government Radio Service of the Department of Commerce which has licensed 3,859 commercial and 15,504 amateur radio stations, was first organized on July 1, 1911, by the Departments of Commerce and Labor. Its original purpose was to aid in enforcing the Wireless Ship Act of June 24, 1910, which specified that vessels carrying 50 or more people and plying between ports 200 miles or more apart, were required to be equipped with radio apparatus operated by a man skilled in its use. In July, 1912, the first act was amended to require an additional source of power for radio, besides the power plant of the ship, as well as a means of communication between the radio room and the bridge, and two or more persons skilled in radio communication, one to be on duty at all times when the vessel was under way.

Today the enforcement of the ship radio laws is under the immediate supervision of the Bureau of Navigation of the Department of Commerce and is accomplished through radio inspectors assigned to the principal seaports on the Atlantic, Pacific, Gulf and Great Lakes coasts. These inspectors are required, as far as possible, to inspect the radio equipment before each sailing of a vessel subject to the law, to determine whether or not the apparatus is efficient and will afford proper protection to the passengers and crew.

Commercial and other land stations came in for their supervision in 1912, when an act to regulate radio communication was approved on August 13. This work is also handled by the Bureau of Navigation, and requires the inspection and licensing of all radio transmitting stations except those belonging to the Government. All operators working in such stations are also examined and licensed by the Radio Section of the Bureau.

In addition to the above laws of the United States, it is a duty of the Bureau of Navigation to require compliance with the International Radiotelegraph Convention of 1912.

There are nine radio-inspection districts, embracing the United States, Porto Rico, Hawaii, and Alaska. All told, the radio transmitting stations in the United States totaled 20,841 on July 1, but as Government land and ship stations are not controlled by the Department, only 19,363 stations were licensed.

Of the total stations 15,504 are amateur, 2,774 commercial ships, 1,194 Government ships, 575 commercial land, 284 Government land, and 511 special stations.

The Radio Section issues several publications, among them a monthly service bulletin, and annual lists of Commercial and Government Radio Stations, and Amateur Radio Stations. The 1922 editions of the station lists are now in press and are expected to be ready for distribution at the Government Printing Office about October 15.

AMATEUR RADIO WORK RESTRICTED IN GERMANY

German manufacturers of radio apparatus and equipment are not in a position to make extensive deliveries of their product, according to Vice-Consul Nathanial B. Davis, Berlin, in a report to the Department of Commerce. This is due to the fact that up to the present time the demand has not been sufficiently great to warrant the manufacture of radio instruments in large quantities.

Amateur radio work is not popular in Germany and stations are not numerous. Radio telephony in particular is almost an unknown science except to engineers, professional operators and experimenters.

The principal reasons given for the lack of interest in radio on the part of the gen-

ATLANTA to CHICAGO with Loop Aerial and ERLA Transformer

FERRY RADIO LABORATORIES
(INCORPORATED)
1311 FIRST NATIONAL BANK BLDG.
CHICAGO
TELEPHONE RANDOLPH 1724

September 15, 1922

Electrical Research Laboratories,
2515 South Michigan Avenue,
Chicago, Illinois.

Gentlemen:

Confirming our conversation of today, our selection of ERLA Radio Frequency Transformers as standard equipment in receiving sets of our manufacture was based on an exhaustive series of tests of practically every make of Transformer on the market.

Results, when used with the FRL Super Receiver, conclusively prove your Transformer to be by far the best available; in fact, we were genuinely amazed at the improvement shown.

Using a loop aerial and three-stages of Radio Frequency, we have been hearing concerts broadcasted from Atlanta, Georgia, and with the same equipment we have been getting Detroit, St. Louis and Kansas City in the daytime, even during the extreme hot weather just passed.

Due to the installation of your Transformer we believe that we now have certainly the most efficient receiving set on the market, and consequently look forward to a greatly increased and mutually satisfactory business this fall and winter.

With best wishes for your success, we remain,

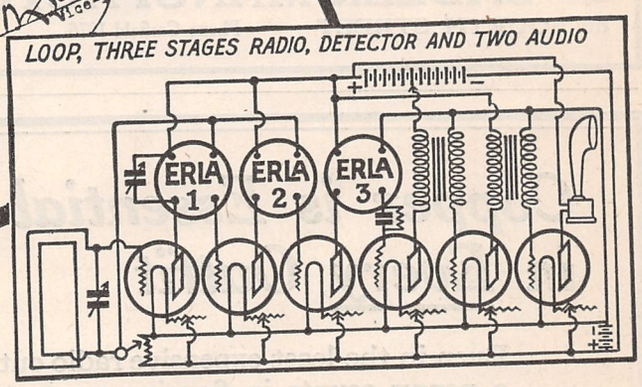
Yours very truly,

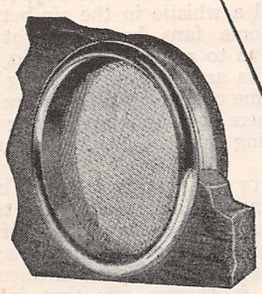
FERRY RADIO LABORATORIES INC.

By _____ Vice-President.

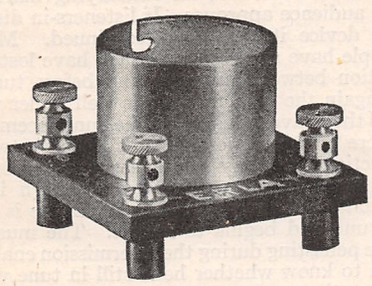
JAW-M

Erla radio frequency transformers are manufactured in three types, AB 1, AB 2, and AB 3. List price—$4.00 each.





Erla bezels improve 100% the appearance of any receiving set. Telescoping rim fits 1½ in. hole in any ⅜ in. to ¾ in. panel. List price—20c.



The strongest and most exquisitely finished socket on the market. All metal parts heavily nickeled. Polished Radion base. Insulated hard rubber feet. Special binding posts. Rugged contact springs will not arc with 5-watt tubes. List price—$1.00.

JOBBERS—Write for our liberal terms and discounts

For Maximum Results Use ERLA

Following a series of exhaustive tests, Erla radio frequency transformers have been adopted as standard equipment by the Ferry Radio Laboratories of Chicago, in all receiving sets of their manufacture.

Whether employed for one, two or three stages of amplification, Erla transformers conclusively proved their superiority over other makes.

Using a loop aerial and the hook-up shown above, Atlanta, Denver and Schenectady, a thousand miles distant, are regularly heard in Chicago through a loud speaker. Nor is there a separate amplifier employed, ample power being supplied by the receiving apparatus alone.

Erla is the first transformer successfully to overcome the high capacitance effects of domestic vacuum tubes. Likewise, the capacitance effect of the transformer itself has been reduced to a degree heretofore unattained, resulting in a corresponding improvement in range, purity and tone volume.

Old style regenerative receiving sets can be made genuinely efficient by substituting a single stage of Erla radio frequency for one of the two stages of audio frequency now employed.

Ask your dealer for diagrams of guaranteed Erla radio frequency circuits, with complete directions for installing, or write us direct, giving your dealer's name.

ELECTRICAL RESEARCH LABORATORIES

Dept. D, 2515 Michigan Avenue, Chicago

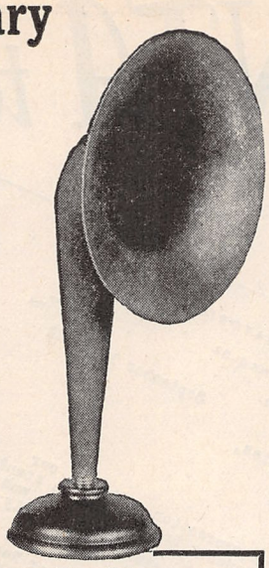
A Revolutionary Change—

TRUTONE
TRADE MARK

The New Non-Metallic Loud Speaker Supreme

TRUE TO ITS NAME

PATENT PENDING



A Perfect Radio Reproducer

Type A-1 Type B-2

THE TRUTONE Amplifying Radio Horn is scientifically designed in accordance with Acoustic laws, constructed of *Non-Metallic* Seamless Composition with an approved wooden tone chamber in base, which brings out clear resonate trutone values with the maximum of volume. The base of type A-1 is designed for ready reception of both Receivers without removal of Head Band. Phones resting against Soft Rubber Ears, thus blending strength of both into one. Horn and base finished in Black Crystaline Baked Enamel, Nickel Trimmings; 12-inch Bell, stands 24 inches high. Packed in individual cartons.

PRICE
$6.50
EITHER TYPE
Sent Postpaid
$7.00 East of Rockies
Dealers: Write for discounts.

THE TRUTONE Amplifying Radio Horn, scientifically constructed of Seamless *Non-Metallic* Composition, is free from the objectionable *Metallic Ring* common to most Loud Speakers. It is light, durable and ornamental. The base of Type B-2 is designed for ready reception of any single Receiver, "Baldwin" or others. Horn and base finished in Black Crystaline Baked Enamel, Nickel Trimmings; 12-inch Bell, stands 22 inches high. Packed in individual cartons. Horn fits either type base. Price with both bases $8.00.

Horn Without Base $5.00. Ferrule for Adapting Horn to Magnavox 25c

Manufactured by

Mfgd. By— **SADLER MANUFACTURING CO.**

86 FOURTH STREET Phone Garfield 1076 **SAN FRANCISCO**

Copper is Essential in Every Outfit

Even in the least expensive radio outfits, where a penny counts in figuring up costs, *Copper* is specified for aerials.

Copper being the best conductor of electricity, it is the metal that can be depended upon to carry the signals with the greatest strength and clearness.

Wherever electricity is to be conducted, USE COPPER.

COPPER & BRASS RESEARCH ASSOCIATION

25 Broadway - New York

RADIO FOR THE NATION

Stores in five large cities enable this organization to supply radio equipment, both wholesale and retail, with the greatest speed and economy.

20th Century Radio Corporation
565 Fifth Avenue, New York City
Straus Bldg., Suite 710

Stores in Norwalk, Conn., Detroit, Mich., Newark, N. J., Brooklyn, N. Y., White Plains, N. Y.

DEALERS, ATTENTION

We Pay Spot Cash for Your Surplus Radio Stocks

Chicago Salvage Stock Store
509 S. State St. Chicago, Ill.

eral public are that amateur stations are a luxury beyond the means of the average German, under present economic conditions, and official restrictions on their use.

All radio communication in Germany is under the control of the Federal Post Office Department, which operates the commercial stations. Private installations must ordinarily be made by the department, but in exceptional cases private companies or individuals may be authorized to erect their own plants, but they must first obtain a license from the Post Office Department. The fee for such a license varies according to the size of the plant, with a maximum of 2,000 marks per annum.

At present only one station in Berlin is licensed to broadcast. This station broadcasts market and exchange quotations. Subscribers to their service are permitted to install receiving stations upon payment of the license fee and the monthly subscription rates, which vary at present from 1,000 marks to 7,500 marks, according to the class of subscription. Subscribers may rent receiving sets from the Post Office Department for 2,500 marks per month if they do not desire to build their own.

A similar service for broadcasting news items is being planned, but has not yet been put into operation. The organizers of this service, however, intend to serve provincial newspapers rather than amateurs.

In spite of the lack of demand for short-wave amateur apparatus, there are a number of firms in and about Berlin which manufacture either complete receiving sets or parts. Vacuum tubes are almost unavailable and practically all receiving sets manufactured in this district operate with crystal detectors.

NOVEL WHISTLE EMPLOYED AT WGY AS IDENTIFIER

Will Enable Fans to Tune In During Intermissions Between Numbers

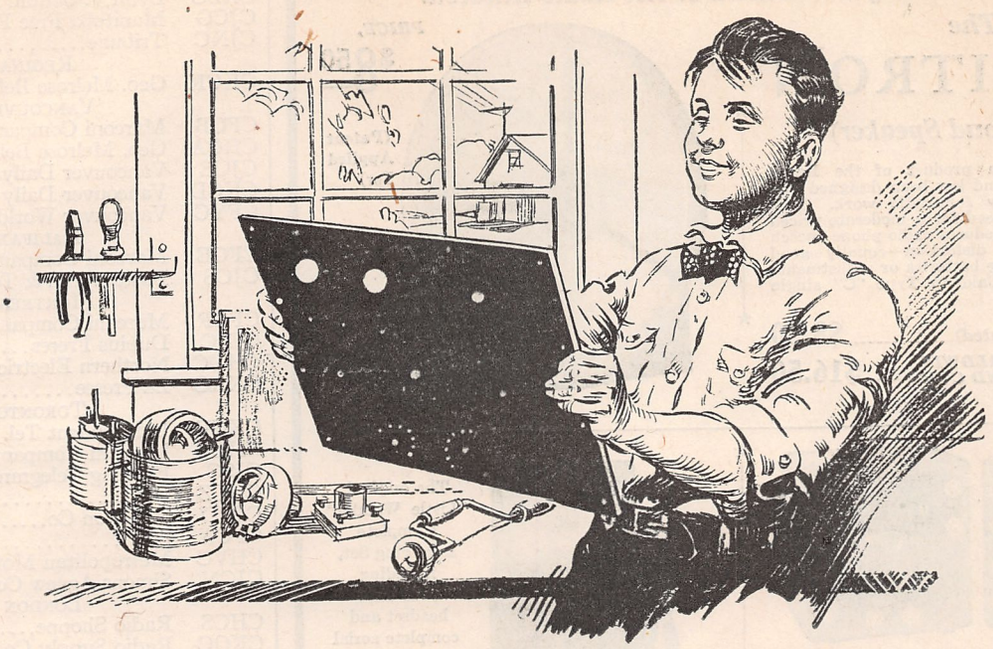
Those who have listened-in recently on the programs of WGY, Schenectady, N. Y., have observed a whistle in the air between numbers. Some fans have thought the whistle was due to an imperfection in their receiving outfits and others, observing that the whistle came only from WGY, were convinced that there was something wrong with the transmitting outfit. Neither theory is right.

The whistle or musical note is caused by an audio frequency oscillator used at the transmitting source for the convenience of the audience. The oscillator comes into play by means of a relay which is operated when the studio switch is thrown off; that is, the instant a musical number is ended in the studio the whistle starts.

According to officials of the station, this musical note or whistle will become a characteristic of WGY, an identifying mark, if the audience approves. If listeners-in dislike the device it will be discontinued. Many people have reported that they have lost the station between numbers and before tuning in again the next number is well under way and they have failed to get the announcement. There is sometimes a slight delay between selections, a delay which seems minutes to the man at the receiving set though it is actually only seconds. He thinks he is out of tune and begins to retune. The musical note persisting during the intermission enables him to know whether he is still in tune with the station.

CANADIAN BROADCASTING STATIONS

Call Signal		Wave-length Meters
CFAC	Geo. Melrose Bell	430
CHBC	Albertan Publishing Co.	410
CHCQ	Westen Radio Co.	400
	EDMONTON	
CJCA	The Journal	450
	NELSON, B. C.	
CJCB	J. G. Bennett	400
	ST. JOHN, N. B.	



This Panel Will Improve Your Set

CONDENSITE CELORON

The best panel made is none too good for your set. Dependable insulation is vital because it has a direct bearing upon the clearness and sensitivity of both transmission and reception.

Every thinking radio enthusiast certainly wants the highest type panel he can obtain and the surest way to get it is to insist upon Condensite Celoron.

This strong, handsome, jet-black material is not merely an insulating material—it is a radio insulation made to meet high voltages at radio frequencies. That is why it will give you greater resistivity and a higher dielectric strength than you will ever need.

Make your next panel of Condensite Celoron. It machines readily, engraves with clean-cut characters and takes a beautiful polish or a rich dull-mat surface.

An Opportunity for Radio Dealers

Condensite Celoron Radio Panels and Parts offer a clean-cut opportunity to the dealer who is keen on building business on a quality basis. Write us today. Let us send you the facts. You'll be interested.

DIAMOND STATE FIBRE COMPANY

BRIDGEPORT (near Philadelphia), PA. Branch Factory and Warehouse, Chicago

Offices in principal cities

In Canada: Diamond State Fibre Co. of Canada, Ltd., Toronto

RADIO SERVICE PRODUCTS

The Acknowledged Standard of the Radio Amateur

The

AMPLITRON

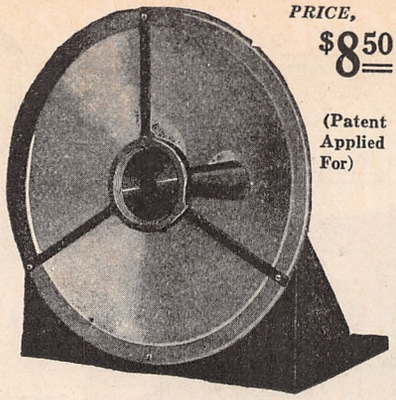
(A Real Loud Speaker)

The Amplitron is a product of the Radio Service Laboratory and has been designed and constructed especially for radio work. This instrument fills the need for a moderate priced loud speaker. It reproduces radio phone speech and music without distortion—equally good for code. No exciting batteries or adjustments necessary. Uses a Baldwin Type "C" single phone.

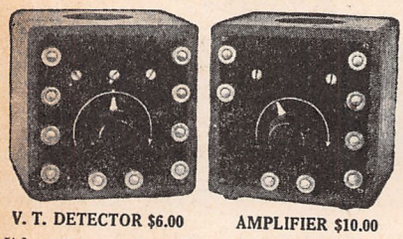
Price *(as illustrated)*.....$8.50

Price *WITH BALDWIN PHONE AND CORD*.....$16.50

PRICE, $8.50

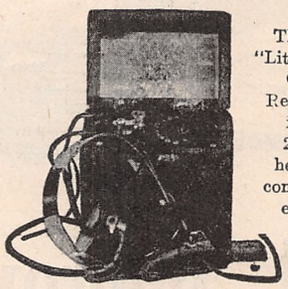


(Patent Applied For)



V. T. DETECTOR $6.00 AMPLIFIER $10.00

Midget Type Detector and One-Stage Amplifier, size 4½"x4½"x4½", Formica Panel, Oak Cabinet, interior construction equal to high-priced instruments.



The original "Little Wonder" Complete Receiving Set, including 2000 ohm headset and complete aerial equipment

$15.00

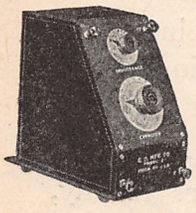
RADIO SERVICE & MFG. CO.

EST. 1918

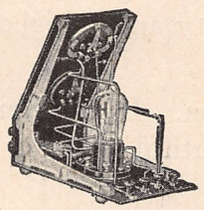
Sales Division: 507 5TH AVE., N. Y. C. Factory: LYNBROOK, L. I.

E-D TRADE MARK

The Set that Grows



Front View, Panel No. 2



Rear View with Cover Removed, Panel No. 9

There is the nucleus of your future set.

A 150 to 3000 meter bank wound tuner and an audio detector equipped with potentiometer.

Add other panels for loud speaking, greater distance and more select tuning.

Our bulletin No. 302 describes these novel sets with their outstanding features.

Write for it!

THE E·D·MANUFACTURING CO.

PHILADELPHIA, PA.

"LISTEN IN WITH ED."

KRL

Myers High-Mu Audion

A tube which brings in the stations five times louder than other tubes. Try one of these excellent little vacuum bulbs, $5. Receptacle, $1. KRL Circuit. Postage and Insurance free.

THE KEHLER RADIO LABORATORIES

Dept. R, ABILENE, KANSAS

PHANTOM-CIRCUIT

"BUILD YOUR OWN"

This Marvel of Mystery, without aerial ground or loop, brings in Music instead of Static Showers. We consistently hear concerts on Magnavox from stations 100 miles distant, loud enough to be heard 150 feet from horn. The simplicity of this circuit will surprise you. Complete instructions, including price list of parts constants and photo of circuit sent prepaid for 60c.

VESCO RADIO SHOP, Vacaville, Calif.

CJCI	McLean, Holt & Co.	400
	WINNIPEG	
CHCF	Geo. Melrose Bell	430
CKZC	Lynn V. Salton	420
CJCG	Manitoba Free Press	410
CJNC	Tribune	400
	REGINA	
CKCK	Geo. Melrose Bell	420
	VANCOUVER	
CFCB	Marconi Company	440
CHCA	Geo. Melrose Bell	430
CJCE	Vancouver Daily Sun	420
CKCD	Vancouver Daily Province	410
CFYC	Vancouver World	400
	HALIFAX	
CFCE	Marconi Company	440
CJCS	Eastern Tel. & Tel. Co.	410
	MONTREAL	
CFCF	Marconi Company	440
CJBC	Dupius Freres	420
CHYC	Northern Electric Co.	410
CKAC	La Presse	430
	TORONTO	
CKCE	Independent Tel. Co.	450
CHCB	Marconi Company	440
CJSC	Evening Telegram	430
CHCZ	Globe	420
CJCD	T. Eaton Co.	410
CFCA	Star	400
CHVC	Metropolitan Motors	410
CJCN	Simons Agnew Company	410
	LONDON	
CHCS	Radio Shoppe	410
CKQC	Radio Supply Co.	410
CJGC	Free Press	430
	HAMILTON	
CKOC	Wentworth Radio Sup. Co.	410
	OTTAWA	
CHXC	J. R. Booth, Jr.	400
	FORT FRANCES, ONT.	
CFPC	Internat'l Radio Dev. Co.	400

NEW BROADCASTING STATIONS LICENSED

WNAD—Atkinson County Mail, Rockport, Mo.

WKAY—Brenau College, Janesville, Ga.

WKAX—Wm. A. MacFarlane, Bridgeport, Conn.

WI AC—North Carolina State College, Raleigh, N. C.

WLAH—Samuel Woodworth, Syracuse, N. Y.

WLAV—Electric Shop, Inc., Pensacola, Fla.

WNAF—Enid Radio Distributing Co., Enid, Okla.

WOAA—Dr. Walter Hardy, Ardmore, Okla.

WLAZ—Hutton & Jones Electrical Co., Warren, Ohio.

WOAE—Medland College, Fremont, Neb.

WLAY—Northern Commercial Co. of Alaska, Fairbanks, Alaska.

WMAK—Norton Laboratories, Lockport, N. Y.

WNAD—Oklahoma Radio Eng. Co., Norman, Okla.

WNAB—Park City *Daily News*, Bowling Green, Ky.

WMAL—Trenton Hardware Co., Trenton, N. J.

WMAP—Utility Battery Service, Easton, Pa.

WLAW—New York Police Dept., New York City.

WNAH—Wilkes-Barre Radio Repair Shop, Wilkes-Barre, Pa.

FOUR NEW LICENSES

During one week recently only four licenses were issued for regular 360-meter broadcasting stations, as follows:

WLAX—Greencastle Community Broadcasting Station (Putnam Electric Company), Greencastle, Indiana.

WLAS—Hutchinson Grain Radio Co., Hutchinson, Kansas.

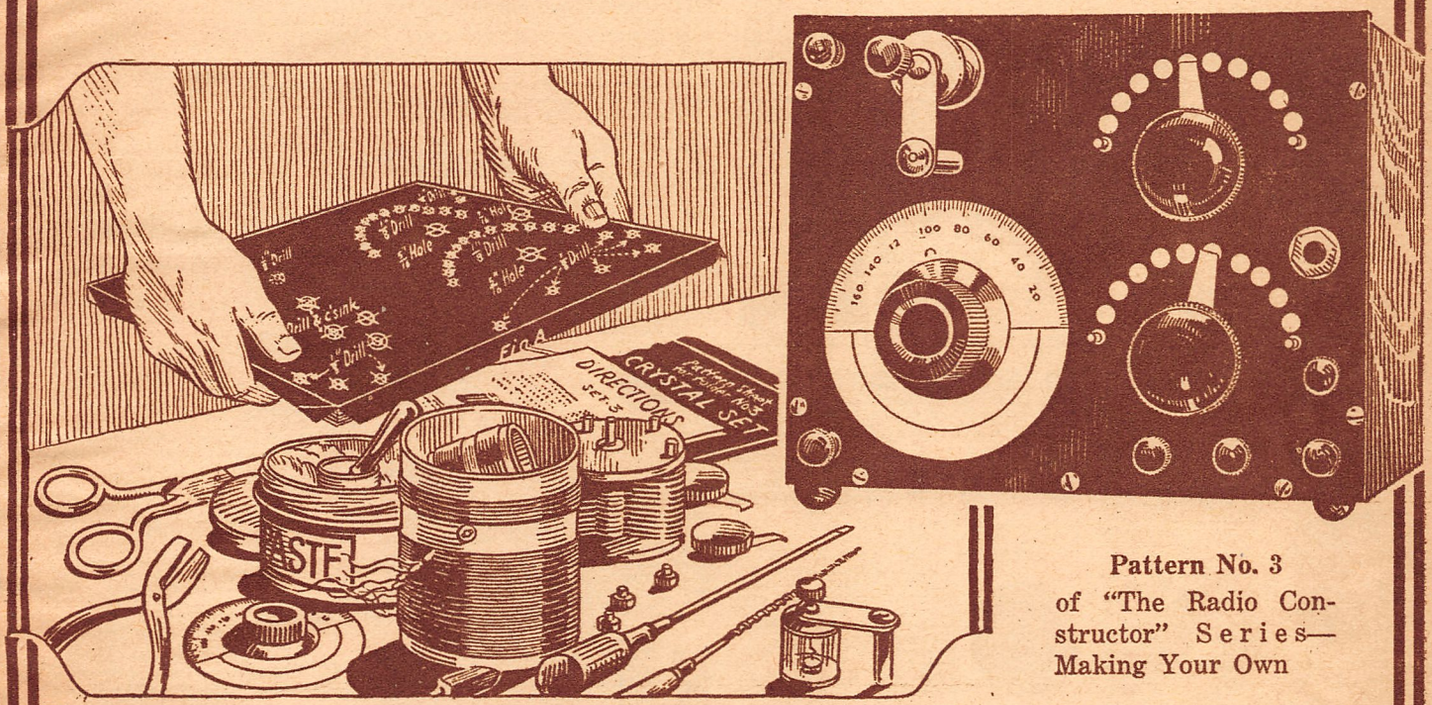
WPAN—Levy Bros. Dry Goods Co., Houston, Texas.

WMAG—The Tucker Electric Co., Liberal, Kansas.

your hands can make a

RADIO PHONE CRYSTAL SET

—at a fraction of what one would cost made up!



Pattern No. 3
of "The Radio Constructor" Series—
Making Your Own

PATTERN NO. 3: HOW TO MAKE A RADIO PHONE CRYSTAL SET

Our Complete Instructions and Blue Prints Are Designed For Those Without Technical Knowledge

No Machine Shop or Heavy Tools

You can build this splendid, reliable radio phone crystal set quite easily without a machine shop, or the use of any heavy tools. These patterns will make a handsome looking instrument with all the improvements to be found in the expensive, ready-made apparatus.

Only Standard Parts Used

One of the foremost radio engineers has constructed this set for us, especially for the amateur, and he has used only standard parts that may be procured from any supply house, and that are lowest in price.

Pattern No. 3

Complete radio phone crystal set, which, when completed and hooked to aerial, phone and ground, is ready for action! You receive a Four-Page illustrated Direction-Pamphlet Size 8½x11½ inches. One Blue-Print Pattern, Size 16x22 inches. All Contained in a Heavy Two-Color Printed Envelope, 9x12 inches.

50c

Every Pattern is Full Size

Take for instance the pattern for the panel. It is printed on heavy blue-print paper exactly the size of the panel to be used. The position of the holes and other markations are exact, so that all you have to do is to paste the pattern on top of your panel by means of ordinary library paste, and when dry drill right through the pattern wherever the marks are located.

As Simple to Make as to Read

All the fun of building your own without any of the hardship. In this set of patterns we do not merely give you pictures of how the apparatus looks, and mere diagrams, but each and every pattern supplied is full size.

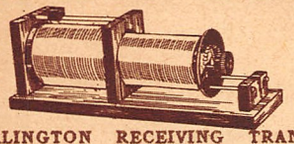
This does away with all fussing and calculating, as we have done all the laying out in our own shop, and you need not worry that the final instrument does not come out right.

ORDER FROM YOUR DEALER—*or direct from us*

CONSOLIDATED RADIO CALL BOOK CO., Inc.
PUBLISHERS
98 Park Place NEW YORK CITY

RADIO GOODS—BEST QUALITY—REDUCED PRICES

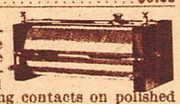
PRESERVE THESE PAGES—ORDER FROM THEM AND SAVE MONEY
FAST SERVICE—TRY US AND BE CONVINCED
THE PRICES QUOTED DELIVER THE GOODS TO YOUR DOOR
THIS GUARANTEE PROTECTS YOU—Examine the goods we ship you. They must suit you in every respect. If you are not satisfied with your purchase return the goods at once and we will refund the price you paid.



ARLINGTON RECEIVING TRANSFORMER

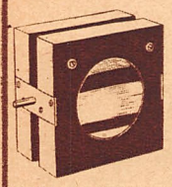
Will tune in all stations up to 3,500 meters. Very efficient on short waves and for radiophone reception. Used with our Detector Two Step Amplifier it produces very excellent results. Also does good work with crystal detector. Silk covered windings on formica tubes. Very fine mahogany finish wood work. Base size 6x18 inches. Slider controls primary, 12 point switch on secondary. Can be tuned very close. A wonderful value at our price.
N720 Price $6.95

TUNING COIL



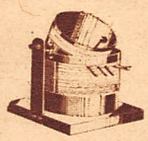
Range up to 950 meters. Wound with bare copper wire, machine spaced. Ends of mahogany finished hard wood. Two easy sliding contacts on polished brass rods, four binding posts. Substantial, efficient, attractive. Length, 8¾ in.
N722 Price $2.45

VARIOMETER



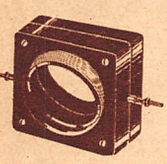
N410—Completely assembled, price $3.20
N411 Not assembled but all parts complete, including winding form, $1.90
Perfect in design and construction. Accurate wood forms of genuine solid mahogany. Correct inductive ratios. Solid baked windings. Positive contacts. Highest efficiency.

VARIO-COUPLER



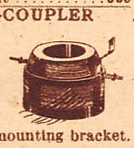
With this loose coupler and two variometers, together with the necessary other parts, a highly efficient tuning set can be made. Easily mounted on panel. Primary winding on formica tube. Inductively coupled for 180 to 600 meters. Multiple taps permit fine tuning.
N415 Price, completely assembled $2.95
N416 Not assembled but all parts complete. Price $1.35
N417 Rotor ball only. Each 29c
N418 Bakelite stator tube only. Each .. 35c

MOULDED VARIOMETER



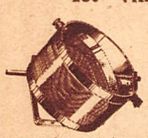
Polished black moulded rotor and stator forms. Maximum inductance with greatest efficiency and minimum distributed capacity. A high grade durable instrument that will make up into a set you will be proud of and will get the best results. Wave length 180 to 600 meters. 4¼" square. 1⅜" thick. Shaft threaded 8-32.
N412 Price $4.65
N413 Brackets for panel mounting, pair .. 29c
N912—3" Dial and knob to fit 65c

MOULDED VARIO-COUPLER



This coupler is designed to work with the above variometer. The stator and rotor forms are of polished black moulded composition. Primary has seven taps to enable finest tuning. Wave length range 180 to 650 meters. Fitted with panel mounting bracket. Shaft threaded 8-32.
N419 Price $3.95
N910 Moulded dial to fit 65c

180° VARIO-COUPLER



N418 Price $3.55
The most efficient type of coupler. Insures sharper tuning and louder signals. Primary and secondary wound on genuine bakelite tubes. Secondary connections through soldered flexible cables eliminates contact noises. Primary has 7 taps. Can be panel or table mounted. Range 180 to 650 meters.

BRASS ROD

Supplied only in 12 inch lengths.
N961 Threaded 6-32, per 12 inch length .. 8c
N963 Threaded 8-32, per 12 inch length .. 10c
N965 Solid 3-16 inch, per 12 inch length .. 10c
N967 Solid ¼ inch, per 12 inch length 12c

SPAGHETTI

For covering connecting wires in sets. For size 12 and 14 wires.
N955 Finest quality braided and saturated with best baked lustrous transparent insulating varnish, 3 feet for 29c
N956 Best quality braid and covered with good grade insulating compound, 3 feet for .. 12c

TINNED COPPER WIRE

Size 14 tinned copper wire. For wiring sets. Best size for neat job and proper results.
N957 Ten feet for 12c

CHOKE COILS AND RESISTANCES

N355 100 Millihenrie Iron core choke coil. Each $1.20
N354 10 Millihenrie Open core choke coil. Each 92c
N357 12,000 ohm Non-Inductive wire wound resistance. Each $1.58
N356 12,000 ohm Moulded resistance. Each 45c
N358 5 Millihenrie Open core choke coil. Each 92c
N359 1 Henrie Iron core, choke coil, each $1.20

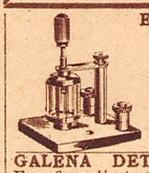
BARAWIK QUALITY HEADSETS

These headsets have proven on rigid tests to be one of the very best on the market. The tone quality is excellent with an unusual volume. Skilled workmen make them from only the best selected materials. The receiver cases are brass in fine polished nickel finish. Polished black ear pieces. Fabric covered head band comfortably and quickly fitted to the head. Supplied with 5-foot cord. These sets were designed to sell for $8.00 and $9.00 each and at our price are a wonderful bargain. We guarantee that you will be pleased with them and agree that they are the best value by far yet offered. If they don't suit you we will cheerfully return your money.
N770—2000 ohm .... $4.00 N772—3000 ohm $5.00

OTHER STANDARD BRAND HEADSETS

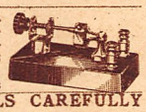
N751	Murdock 56, 2000 ohm	$4.45	N754	Baldwin Type C with universal jack plug	$16.00
N752	Murdock 56, 3000 ohm	5.40	N755	Baldwin Type C unit with attaching cord	$7.75
N764	Frost, 2000 ohm	4.45	N768	Brandes, 2000 ohm	7.20
N766	Frost, 3000 ohm	5.40	N769	Holzer-Cabot, 2200 ohm	7.20
N756	Red Head, 3000 ohm	5.85			
N758	Western Electric, 2200 ohm	10.80			
N771	Kellogg, 2400 ohm	9.75			

ENCLOSED DETECTOR



One of the finest crystal detectors on the market. Supersensitive galena crystal enclosed in heavy glass shield. Quick, positive adjustment. Brass parts polished nickel finish.
N730 Each $1.48

GALENA DETECTOR

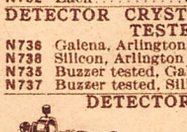


Easy fine adjustment. Crystal mounted in cup. Moulded base and knob. Brass parts polished nickel finish.
N732 Each 89c

DETECTOR CRYSTALS CAREFULLY TESTED

N736 Galena, Arlington tested, per piece .. 19c
N738 Silicon, Arlington tested, per piece .. 19c
N735 Buzzer tested, Galena, per piece 12c
N737 Buzzer tested, Silicon, per piece 12c

DETECTOR PARTS



N725 Price set .. 32c
All metal parts for crystal detector. No base included. Easily assembled. Polished nickel finish.
N727 Detector Crystal Cup. Each 10c
N728 Cat Whisker Wire, 5 feet for 5c

BAKELITE DIAL AND KNOB

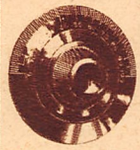
Neat, clean cut design. Clear, plain engraved scale, with enameled white letters contrasting with polished black finish of dial. Fluted knob. Diameter three inches.
N902—For 3-16 inch shaft. Each 61c Dozen $7.20
N903—For ¼ inch shaft. Each 61c Dozen $7.20

Same design Dial and Knob but made of polished black composition. Looks just as well as the bakelite when new but does not retain finish as well and is more fragile.
N908—Three inch 3-16" shaft. } Each 30c
N909—Three inch ¼" shaft. } Dozen $3.00

ONE PIECE DIAL AND KNOB

A fine looking knob and dial moulded in one piece. Neat clean cut design. Polished black finish. Clear plain engraved scale with numbers and lines in contrasting white enamel. Ribbed knob that fits the hand. The three sizes used on the same panel can be arranged to produce a very attractive effect.
Three and four inch sizes are marked 0 to 100 over 180° of the scale. 2½ inch size is marked 0 to 9 over 270° of scale.
N900—2½ in. Diam. for 3-16in. shaft. Each, 45c
N901—2½ in. Diam. for ¼ in. shaft. Each, 45c
N904—3in. Diam. for 3-16in. shaft. Each, 58c
N905—3in. Diam. for ¼ in. shaft. Each, 58c
N906—4in. Diam. for 3-16in. shaft. Each, 75c
N907—4in. Diam. for ¼ in. shaft. Each, 75c

OUR SPECIAL GENUINE CONDENSITE COMBINATION KNOB AND DIAL



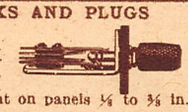
Numerals engraved on bevel and knob so shaped that fingers do not hide them. Thin edge with clear graduation to make accurate reading easy. Concealed set screw in metal insert. Will not warp or chip. Permanent polished black finish with contrasting white enamel figures and graduations. Diameter, 3 inches.
N914 For 3/16 inch shaft. Each 25c
N915 For ¼ inch shaft. Each 25c

MAGNET WIRE

Insulated copper wire. Best quality even drawn wire, one piece to a spool. Prices quoted are for 8 oz. spools.

Double Cotton Covered		Enameled Insulation		Single Green Silk Covered	
Number	N990	Number	N992	Number	N993
Gauge	Price	Gauge	Price	Gauge	Price
18	50c	20	45c	20	$0.78
20	60c	22	55c	22	.92
22	75c	24	61c	24	1.05
24	85c	26	65c	26	1.18
26	95c	30	70c	30	1.70
28	$1.15	32	76c	32	2.05
30	1.65	36	98c	36	2.75

RADIO JACKS AND PLUGS



Finest grade jacks. Improved design. Best materials. Phosphor bronze springs. Silver contact points. Nickel finish. Mount on panels ⅛ to ⅜ in. thick.

Jacks Only
N390 Open circuit. Each 45c
N391 Closed circuit. Each 52c
N392 Two circuit. Each 63c
N393 Single circuit filament cont. .. 70c
N394 Two circuit filament cont ... 88c
N395 Plug. Large space with set screws for attaching cord. Each 54c

STANDARD FLAT PLUG

N398 Each 74c
Black polished case with polished nickel insert. Fits any standard jack. Quick solid connections.

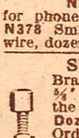
THREE-WAY ROUND PLUG

N397 Each 98c
Takes three pairs of head set terminals. Quick easy connections. Polished round barrel. Fits any standard jack.

COMPETITOR JACK AND PLUG

Well made, durable, smooth working. Interchangeable with any standard Jacks and Plugs. Solder connections. Nickel finished metal parts. Fiber barrel on Plug.
N388 Two Circuit Jack. Each 48c
N389 Standard Plug. Each 48c

BINDING POSTS



Brass, polished nickel finish. Washer and 6-32" screw extending ⅜".
N370 Large size—barrel and knob ¾" long, dozen 95c
N372 Smaller size—barrel and knob 9-16" long, dozen 84c
N374 Large size with composition knob, dozen 50c
N376 Large size with hole for phone tip or wire, dozen 95c
N378 Small size with hole for phone tip or wire, dozen 38c

SWITCH CONTACT POINTS

Brass, polished nickel finish. All have ¾" long size 6-32 screws. All prices the same.
Dozen 20c Hundred $1.40
Order by Article Number.
N360 Head, ¼"; Diam., ¼" High
N362 Head, 3-16"; Diam., ¼" High
N363 Head, 3-16"; Diam., 1-16" High
Solder Lugs to Fit Contact Points
Also for connecting wires to binding posts, etc.
N365 Dozen 12c—Hundred 60c

SWITCH LEVERS

Moulded composition knob. Exposed metal parts polished nickel finish. Fitted with panel bushing, spring and two set nuts. A high grade switch.
N380—1" Radius.... } Each
N381—1½" Radius.... } 22c
N382—1½" Radius....

SWITCH LEVER STOP

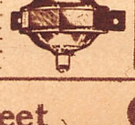
Brass, polished nickel finish.
N386—Dozen 20c, Hundred $1.40

INDUCTANCE SWITCH WITH KNOB AND DIAL

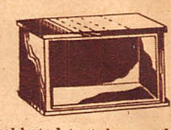
Mounts switch points and contact lever behind panel. Enables you to build neat attractive set. Only one hole needed to mount on panel. 15 switch points, any number of which may be used. Dial indicates position of lever. Smooth wiping contacts, attractive tapered knob.
N385 Price each $1.80

OUTDOOR LIGHTNING ARRESTER

N980 Price $1.68
Protect your instruments with this lightning arrester You cannot afford not to. Weatherproof porcelain case. Air gap type. Permanent. Durable. The most practical quality arrester obtainable. Underwriters approved.



CABINETS



Fine looking cabinets solidly built. Made of genuine solid mahogany in elegant hand rubbed finish. You will be proud of your set mounted in one of these cabinets. Hinged tops. Front rabbeted to take panels. Panels not included. Prices are transportation paid.

Panel Size	Inside Dimensions High	Wide	Deep	Art. No.	Price Each
6x 7"	5½"	6½"	7"	N420	$2.48
6x10½"	5½"	10"	7"	N422	2.75
6x14"	5½"	13½"	7"	N424	3.30
7x14"	6½"	13½"	7"	N423	3.60
7x18"	6½"	17½"	7"	N426	3.90
6x21"	5½"	20½"	7"	N425	3.90
9x14"	8½"	13½"	10"	N428	3.70
12x14"	11½"	13½"	10"	N430	4.40
12x21"	11½"	20½"	10"	N432	5.25

SOLID GENUINE CONDENSITE CELORON PANELS

Notice our very low prices on this fine quality grade 10 genuine solid sheet Condensite Celeron (a product with mechanical, chemical and electrical properties like formica and bakelite). Machines well without chipping. Won't warp. Waterproof. Highest mechanical and di-electric strength. Attractive natural polished. Black finish which can be sanded and oiled for extra fine work.

Panel Size Inches	⅛" thick Art. No.	Price	3-16" thick Art. No.	Price	¼" thick Art. No.	Price
6x 7	N450	$0.50	N460	$0.75	N470	$0.98
6x10½	N451	.75	N461	1.18	N470	1.47
6x14	N452	1.05	N462	1.55	N472	2.05
7x14	N458	1.20	N468	2.60	N478	2.40
7x18	N453	1.55	N463	2.30	N473	3.10
7x21	N457	1.78	N467	2.65	N477	3.60
9x14	N454	1.80	N464	2.30	N474	3.10
12x14	N455	2.10	N465	3.10	N475	4.15
12x21	N456	3.15	N466	4.65	N476	6.20

ETCHED METAL NAME PLATES

Made of brass. Silver plated characters and border on black background. All plates are 1 inch long and ¾ inch wide, except "INCREASE CURRENT" which are quarter circle 1⅛ inch over all, and "ON" "OFF" which are ⅝ inch long. Attaching holes pierced.
N503 Per Dozen 35c
Not less than one dozen assorted sold. Specify marking wanted as follows:—

Plate Variometer	Secondary	Aerial
Grid Variometer	Primary	Ground
Vacuum Tube	Tickler	Phones
Primary Condenser	Lead'g Coil	Input
Secondary Condenser	Coupling	Output
Increase Current (to right)	Parallel	On
	Series	Off
Increase Current (to left)	Detector	1st Step
	A Battery	2nd Step
	B Battery	3rd Step

(Blank—takes pencil or pen marks.)

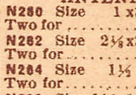
ELECTRIC SOLDERING IRON

N957 Price $5.75
Especially adapted to radio work. Will enable you to do neat clean work quickly. Simply attach to any light socket 100-120 volts. Complete with six foot cord and attaching plug. Renewable solder point. Will last a lifetime for ordinary home or light shop work. A wonderful value at the price.

ROSIN CORE SOLDER

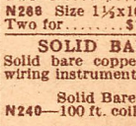
N958 Per Coil 22c
Self fluxing. Especially designed for soldering electrical connections. Fine for use with above electric iron. Coil will last a long time.

TINOL



N959 Per tube 19c
With this preparation you can solder your connections with the heat of a match. Works fast. Makes a perfect electrical and mechanical joint. Self fluxing.

LONG NOSE PLIERS



N970 Price 98c
The handiest pliers for radio work. Made of fine hardened steel. Length 5 inches.

DIAGONAL JAW NIPPERS

N972 Price $1.10
For fine electrical work. Made of hardened steel. Length 5 inches.

ANTENNA INSULATORS

N260 Size 1 x3½. Two for 19c
N262 Size 2½x3½. Two for 58c
N264 Size 1½ x 4. Two for 80c
N266 Size 1½x10½. Two for $1.35

SOLID BARE COPPER WIRE

Solid bare copper wire for aerials, leads or wiring instruments.

Solid Bare Copper Wire, size 14
N240—100 ft. coil 45c N242—500 ft. coil $2.15

Solid Bare Copper Wire, size 12
N244—100 ft. coil 61c N249—500 ft. coil $2.75

STRANDED ANTENNA WIRE

Cabled of fine copper strands. Very flexible. High tensile strength. Best for aerials.
N248—100 ft. coil 85c N249—500 ft. coil $2.95

THE BARAWIK CO. 102 South Canal Street CHICAGO, ILL.

BUILD YOUR SET WITH BARAWIK STANDARD

PLATE CIRCUIT "B" BATTERIES

You can make real savings on these batteries. Don't pay more. We guarantee them to equal any on the market regardless of price. Absolutely uniform. Extra long life.

N180 Signal Corps type, small size, 15 cells, 22½ volts. Each.....95c

N182 Large Navy size, 6½x4x3, 15 cells, 22½ volts. Each.....$1.75

N184 Variable Large Navy size, 5 taps, giving range from 16½ to 22½ volts in 1½ volt steps. Each.....$1.80

N186 Double Navy size 6½x4x6, 30 cells, 45 volts. Suitable for amplifier circuits and power tube use. Two or more of these units in series may be used in C. W. and radiophone circuits. Each.....$3.40

N188 Combination Tapped 45 volts, 30 cell, 6½x4x6 battery. Tapped to give 45, 22½, 21, 19½, 18, and 16½ volts. Handles both detector and amplifier tubes. Each.....$3.55

4½ VOLT "C" BATTERY UNIT

For use in grid circuit. Also can be used to make up "B" batteries.

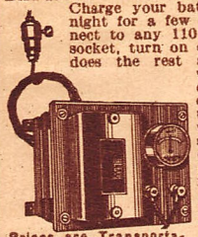
N189 Each.....39c

WILLARD "B" STORAGE BATTERY

Better results. No battery noises. Cheaper in the long run. Easily recharged by our Battery Charging Rectifier. Leak proof glass jars. Will last for years.

N205 Price.....$9.00

BATTERY CHARGING RECTIFIER

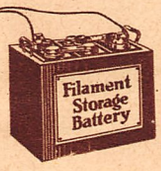


Charge your battery at home over night for a few cents. Simply connect to any 110 volt 60 cycle light socket, turn on current and rectifier does the rest automatically. Will work for years without attention. Simple connections. Gives a tapering charge which batteries should have. You can make it pay a profit charging your friends' auto batteries. Long connecting cords with pair of battery clips.

Prices are Transportation Paid

N201 For 6 volt battery.....$13.95
N203 For 12 volt battery.....13.95

STORAGE "A" BATTERY



A very high grade battery made especially for radio service. Guaranteed for three years. Properly cared for will give many more years of service for filament lighting. Made of best new materials. Full capacity.

N194 6 volt, 40 ampere size. Each.....$10.00
N196 6 volt, 80 ampere size. Each.....$12.50

Prices are Transportation Paid

BATTERY CLIPS

N198 Two for.....26c

Clip onto storage battery terminals lead coated. Make positive non-corrosive contact at all times.

WIRE CONNECTING CLIPS

N199 Per dozen.....30c

Small connecting clips for fastening leads onto binding posts, etc. Handy and useful. Every radioist should have at least a dozen.

PORCELAIN BASE SWITCHES

Fine white porcelain bases. Copper contacts and blades. Can be used as antenna switches.

N385 Single Pole Single Throw. Each.....20c
N387 Single Pole Double Throw. Each..32c
N384 Double Pole Double Throw. Each.50c

FILAMENT CONTROL RHEOSTATS

Crosley—Wound on vulcanized fiber. Adjustable to any panel. Complete with knob.

N130 Each.....54c

Best grade. High heat resisting base. Diam. 2⅛ in. cap. 1½ amp. Resist, 6 ohms. 1¼ in. Knob with pointer.

N132 Each.....60c

POTENTIOMETER

Same style as above rheostat. Gives fine "B" battery adjustment. Resistance 100 ohms.

N133 Each.....$1.18

VERNIER RHEOSTAT

Gives exceedingly fine control of a battery current. A necessity for best receiving results.

N135 Each.....$1.19

QUICK ACTING VERNIER RHEOSTAT

Gives very fine control of current and can be switched on or off instantly at any desired point.

N124 Each.....$1.27

Porcelain Base Rheostat for table mounting. Resist, 10 ohms.

N136 Each.....78c

WE PAY TRANSPORTATION CHARGES EAST OF THE ROCKIES

THE PRICES QUOTED DELIVER THE GOODS TO YOUR DOOR

FAST SERVICE—TRY US AND BE CONVINCED

THIS GUARANTEE PROTECTS YOU—Examine the goods we ship you. They must suit you in every respect. If you are not satisfied with your purchase return the goods at once and we will refund the price you paid.

SPECIAL OFFER ON TWO HIGH GRADE RECEIVING INSTRUMENTS

Regenerative Tuner and Detector—Two Step Amplifier

N220 The two for.....$67.50

This is a combination unequalled for clear long distance radiophone receiving. With a good aerial the range is only limited by the power of the transmitting set. Send for complete descriptive circular.

REGENERATIVE TUNER

N224—Price $37.50

This is a standard make Armstrong licensed set. Range from 180 to 600 meters. Will tune sharply and bring in signals strong even under difficult conditions. Fine Mahogany finished large size cabinet. Satin finished Formica Panel. Two high grade variometers, with variocoupler for closest tuning. Engraved dials, knobs, switches, binding posts for all necessary connections, etc. A high grade outfit worth much more than we ask.

DETECTOR-TWO-STEP AMPLIFIER

N222—Price $35.00

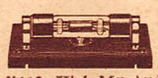
A very sensitive high grade instrument. Signals that cannot be heard with detector alone will be brought in strong. Has one detector and two amplifying circuits. Standard tube sockets, grid condenser in detector circuit, two amplifying transformers, 3 jacks and a plug. Satin finished Formica Panel. Fine Mahogany finish large size cabinet. Hinged top. Interior easily accessible. Binding posts for all necessary connections.

VACUUM TUBES

Standard Brands—Cunningham Radiotron. Every one guaranteed new and perfect. We will ship brand in stock unless you specify otherwise. Four-in-one screw-driver included with each tube.

N105 Detector. Each.....$5.00
N110 Amplifier. Each.....6.50
N115 5 Watt Transmitter....8.00

MYERS TUBES



Can be used in Myers receptacle or in any standard socket with adapter listed.

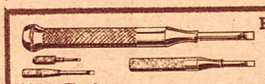
N113 High-Mu Audion. Has 5 times amplification of ordinary tubes. Oscillates anywhere from 2 to 300 volts on plate. Four-in-one screw-driver included with each tube. Each.....$5.00
N116 Receptacle for above. Each.....$1.00
N117 Adapter to adapt Myers tubes for use in any standard socket. Each.....$1.05

MYERS CHOKE COIL

For Audio Frequency Amplification. Designed to work with Myers tubes. Brings in loudest signals. Flexible over a broad band of wave lengths. Free from amplifier noise and distortion. Mounts in Myers special receptacle.

N119. Each.....$3.50

FOUR-IN-ONE SCREW-DRIVER



N974 Each.....55c

Especially suitable for radio work. Will handle any size screw used. Smaller drivers nest inside larger one and are held in place with screw cap. Made of steel, nickel finished.

FREE WITH EACH VACUUM TUBE

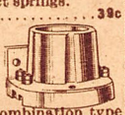
a Four-in-one screw-driver. Every radio builder can use several of these handy tools.

VACUUM TUBE SOCKETS

Our Special Socket. A wonderful value. Moulded entirely of bakelite. Four binding post connections. Right angled contact springs.

N140 Each.....39c

PORCELAIN BASE AND TUBE



N144 Crosley for either panel or table mounting.....42c

High Grade combination type for panel or table mounting. Metal tube. High insulation base.

N146 Each.....45c

Paragon combination type for panel or table mounting. One of the best designed and best made sockets on the market. Metal tube bakelite base.

N148 Each.....$1.10

TWO AND THREE GANG SOCKETS

These sockets make it easy to build detector and amplifier units and make a neat, compact, workmanlike job. Perfectly made of high grade materials. Metal tubes mounted on fiber base. Quickly mounted on panel or base.

N147 Two gang socket.....$1.20
N149 Three gang socket.....$1.65

FIXED CONDENSERS

Moulded cases, nickeled binding posts.

N804 Each.....55c

CARBON PRESSURE DISC VERNIER RHEOSTAT

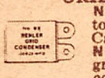
Current regulation is obtained by changing of pressure on carbon discs. This permits of infinitely fine variation of current. Very durable. Resistance 15 ohms. Capacity 2½ amperes.

N131 Each.....$1.65

VARIABLE GRID LEAK

Pencil mark type. Resistance may be varied exactly as needed. **N160** Each.....24c

GRID CONDENSER



N182 Mounting holes spaced to fit lugs of above leak. Cap. .00025 MF.....19c
N183 Same as 162 but higher grade. Enclosed in metal case.....39c

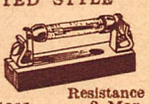
PHONE AND GRID CONDENSERS

A compact, style of condenser that is very satisfactory. Conducting sheets and dielectric are wound on fiber strip with eyelets for mounting and connections.

Price, each.....12c
N170 Phone Condenser .001 Mfd.
N172 Phone Bridging Condenser .0005 Mfd.
N174 Grid Condenser .00025 Mfd.

N176 Grid Condenser .00025 with pencil mark leak. Each.....24c

TUBULAR GRID LEAKS AND CONDENSERS—MOUNTED STYLE



Very convenient. Permits quick change of leaks or condensers of varying capacities.

Grid Leaks. Price, Each.....57c			
	Resistance		Resistance
N850	.5 Meg.	**N855**	2. Meg.
N851	1. Meg.	**N857**	3. Meg.
N853	1.5 Meg.	**N859**	5. Meg.

GRID AND PLATE CONDENSERS

Price, each.....55c
N830 .000025 Mfd. Correct for Myers Tubes.
N832 .0001 Mfd. For special circuits.
N834 .00025 Mfd. For U. V. 201 and Cun. 301.
N836 .0005 Mfd. For U. V. 200 and Cun. 300.

MOUNTINGS

Bakelite base. Spring clip contact.
N840 Single mounting. Each.....32c
N842 Double mounting. Each.....57c
N844 Triple mounting. Each.....76c

"HONEYCOMB" COILS

Carefully made—fine looking coils. Highest efficiency. Low distributed capacity effect, low resistance—high self inductance. Very firm enamel impregnation. Range given is in meters when varied with .001 variable condenser. Mounted coils have standard plug mountings.

Turns	Range	Art. No.	Not Mntd.	Art. No.	Price Mntd.
25	120- 250	N301	$0.39	N320	$0.87
35	175- 450	N302	.42	N322	1.00
50	240- 720	N303	.49	N323	1.07
75	390- 910	N304	.54	N324	1.12
100	500- 1450	N305	.58	N325	1.16
150	600- 2090	N306	.63	N326	1.21
200	900- 2500	N307	.72	N327	1.30
250	1200- 3500	N308	.78	N328	1.38
300	1500- 4500	N309	.82	N329	1.40
400	2000- 5000	N310	.87	N330	1.55
500	2800- 6100	N311	1.12	N331	1.70
600	4000-10000	N312	1.27	N332	1.85
750	5000-12000	N313	1.43	N333	2.00
1000	7900-15000	N314	1.70	N334	2.38
1250	9750-19500	N315	1.92	N335	2.60
1500	14500-26500	N316	2.18	N336	2.76

COIL MOUNTINGS

N340 Three coil mounting.....$3.95

High grade fine looking mountings. Polished black composition. Center receptacle stationary, two outer ones adjusted by knobs. Takes any standard mounted coil.

COIL PLUGS

Made of moulded bakelite. Fits any standard plug. Mounts any standard honeycomb coil.

N344 Each.....50c

PANEL MOUNTING COIL PLUGS

Take any standard mounted coils. Made of moulded bakelite, mounted on brackets.

N345 Stationary. Each.....65c
N346 Movable with anti. capacity handle. Each.....95c

RADIO FREQUENCY AMPLIFYING TRANSFORMER

N895 Each.....$3.95

This transformer will get the long distance stations loud and clear. Permits of easy sharp tuning. Helps cut out static and interference. Makes your set sensitive enough to use a loop aerial. Enclosed in metal case affording perfect shielding. Suitable for panel or base mounting. Because of its special design can be mounted in any V. T. socket. Works with any make of tube. Wave ranges 150 to 550 meters. Wiring diagrams included.

OUR SPECIAL AUDIO FREQUENCY AMPLIFYING TRANSFORMERS

As high as three stages can be used without howling due to proper impedence ratio, minimum distributed capacity, low core losses and proper insulation. Mounted style has bakelite panel with binding post connections. Unmounted has core and coils assembled with two holes in core for fastening to apparatus.

N234 10 to 1 Mounted. Each.....$3.95
N235 10 to 1 Unmounted. Each.....3.20
N236 3 to 1 Mounted. Each.....3.90
N237 3 to 1 Unmounted. Each.....3.10

THORDARSON AUDIO FREQUENCY AMPLIFYING TRANSFORMER

An especially high grade transformer with correct characteristics for Cunningham, Radiotron or A. P. Tubes. Wonderful results without distortion on one, two or three steps. Low distributed capacity. Fully mounted bakelite panel.

N232 3 to 1 Ratio. Ea. $4.00
N233 10 to 1 Ratio. Each.....$4.50

RADIO CORPORATION TRANSFORMERS

Audio Frequency Amplifying Transformer. Especially designed for Radiotron tubes. 9 to 1 winding ratio.

N712 Each.....$6.40

RADIO FREQUENCY AMPLIFYING TRANSFORMER

Range 200 to 5000 meters. For long distance reception.

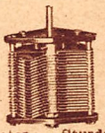
N714 Each.....$5.95

OUR COMPETITOR AUDIO FREQUENCY AMPLIFYING TRANSFORMERS

While these are very low priced transformers, nevertheless they will give excellent results. They are carefully designed and carefully made. Quantity production and small profits make the low price possible. They will equal in results many transformers selling at much higher prices.

N238 Unmounted, with wire leads.....$2.00
N239 Mounted, with binding post connections.....$2.75

BARAWIK SPECIAL PANEL MOUNTING VARIABLE CONDENSERS



N812—43 plate .001 Mfd. $2.40
N813—21 plate .0005 Mfd. 1.90
N814—11 plate .00025 Mfd. 1.40
N815—3 plate Vernier.... 1.10

These are especially high grade condensers and we guarantee them to be mechanically and electrically perfect. Fine polished end plates of heavy bakelite. Shafts ¼ inch diameter. Sturdy aluminum alloy plates perfectly spaced to insure smooth, even reliable capacity. Our low prices save you money. These condensers are of the very best make and are not to be compared with many inferior cheap condensers offered. We guarantee them to please you or your money back.

COMBINATION VERNIER VARIABLE CONDENSERS

N824—23 plate .0005 Mfd. With dial and knobs. Price $3.79
N826—43 plate .001 Mfd. With dial and knobs. Price $4.48

The latest improvement in condensers consists of regular variable condenser controlled by large knob and dial mounted with a three plate vernier condenser, which is controlled by separate knob mounted above knob on dial. This arrangement permits of very fine tuning. High grade design and construction. Finely finished. Suitable for table or panel mounting

ENCLOSED VARIABLE CONDENSER

One of the best made condensers. Rigid, accurately spaced aluminum plates. Formica ends. Engraved scale. Knob and pointer. Clear transparent case.

N806—43 plate .001 Mfd.....$3.95
N808—21 plate .0005 Mfd.....$3.25

KNOCKED DOWN VARIABLE CONDENSERS

You can save money by assembling your own condensers. Formica top and base. Complete with all parts not assembled. Go together easily and perfectly. Panel mounting type.

N820—41 Plate .001 Mfd.....$2.18
N821—21 Plate .0005 Mfd.....1.88

FIBER TUBES

Fiber tubes for winding coils. Strong solid material.

N950 Diameter 3 inches, per foot.....20c
N951 Diameter 3½ inches, per foot.....25c
N952 Diameter 4 inches, per foot.....30c

THE BARAWIK CO. 102 South Canal Street CHICAGO, ILL.

NEAL RADIO COMPANY

234 Fulton Street New York City

SAVE! SAVE! SAVE! Look carefully over this page and notice the attractive low prices for standard radio parts. Every article is backed by the guarantee of the manufacturer.

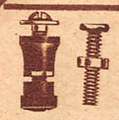
MAIL YOUR ORDER to us at once with money order or stamps. Goods delivered to your door free of any charges in the U. S. east of the Rockies with the exception of storage batteries.

BUILD YOUR OWN SET

and save money by buying your parts from us. We give you the benefit of the same low prices accorded thousands of New York radio fans. We guarantee every article sold by us. Money will be refunded if you are not entirely satisfied. Our aim is to market the very best radio parts made at the lowest possible cost to you. Many of the articles listed on this page are made under our direct supervision, assuring you of their quality and dependability. If the article you want to purchase is not listed on this page

SEND FOR OUR CATALOGUE

BINDING POSTS

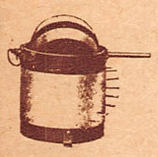


R6 with bakelite top, 10c each—per dozen..... 98c

SWITCH CONTACT POINTS

R9 Brass, highly polished nickel finish; ⅝ inch long with automatic head 3-16 inch diameter, per dozen.....10c

BALDWIN VARIO-COUPLER



R18 Indispensable for a highly efficient tuning set. Multiple taps permit sharp tuning. Easily mounted on panel. Inductively coupled for 150 to 580 meters.

Price, assembled....$4.95

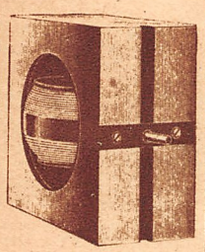
R12 Acme vario-coupler, similar to the Baldwin type.

Price, assembled.....$3.25

FIRCO BULLDOG PLUGS

R69 Price...$1.25 Specially designed terminal approved by U. S. Signal Corps. The most efficient plug on the market.

BALDWIN VARIOMETER



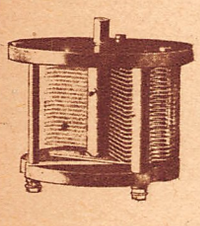
R36 Designed especially to give maximum of inductance with greatest efficiency. Perfect in construction. Guaranteed to give the best results with any set.

Price, assembled....$4.50

R33 Acme variometer, similar to the Baldwin type.

Price, assembled....$3.00

CONDENSERS



R21 43 plate .001 Mfd.....$2.50

R24 23 plate .005 Mfd.....$2.25

R27 3 plate Vernier.....$1.45

These are high-grade variable condensers for panel mounting. Hard rubber tops and bottoms. Guaranteed mechanically perfect. No knobs or dials included.

SWITCH LEVERS

R39 Price.....29c Highly nickel polished wiping contact with 1¼" radius. A high grade switch.

ANTENNA INSULATORS

R63 Designed to reduce surface and leakage. Price, each.....17c

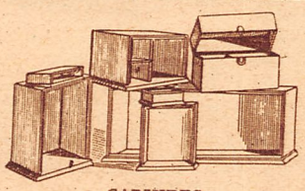
R65 Ball.....26c

R64 5" Lead in $1.00

To protect your radio set from electrical disturbances you should use a Hystatic lightning arrester.

R3.....$1.98

Send for our Catalogue



CABINETS

Made of mahogany, hand rubbed finish. Hinged tops. Transportation paid on all cabinets.

Panel Size	Inside Dimensions High	Wide	Deep	Art. No.	Price, Each
6x 7"	5½"	6½"	7"	R175	$2.48
6x10½"	5½"	10"	7"	R176	2.75
6x14"	5½"	13½"	7"	R177	3.30
7x18"	6½"	17½"	7"	R178	3.90
6x21"	5½"	20½"	7"	R179	3.90
9x14"	8½"	13½"	10"	R180	3.76
12x14"	11½"	13½"	10"	R181	4.40
12x21"	11½"	20½"	7"	R182	5.25

"B" BATTERIES

R20 22½ v. small. Price.....95c

R22 22½ v. large. Price.....$1.75

R23 45 v. large. Price.....$3.00

"Eveready"

R23 22½ v. small. Price.....$1.25

R26 22½ v. large. Price..... 2.50

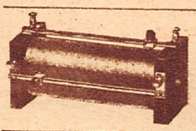
R28 45 v. large. Price..... 4.75

STORAGE BATTERIES

The famous Marko battery. The best grade battery with a two-year guarantee.

R29 6 v. 40 amp. Price.....$8.95

R30 6 v. 60 amp. Price.....$11.50



TUNING COILS

Wound with bare copper wire. Double slider. Very efficient.

R15 Price...$2.00

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One of the best crystal detectors on the market. Enclosed in heavy glass shield. Dust proof. Beautifully set.

R72 Price.....$1.75

R73 Without glass shield Price 95c

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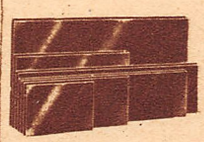
Our prices on these well-known panels are considerably lower than those quoted by other concerns. All panels are shipped prepaid.

Panel Size, Inches	Is a standard workable size 3-16" thick Art. No.	Price
6x 7	R208	$0 75
6x10½	R209	1.18
6x14	R210	1.55
7x18	R211	2.30
7x21	R212	2.85
9x14	R213	2.30
12x14	R214	3.10
12x21	R215	4.65



MAGNAVOX LOUD SPEAKER

R42 Price.....$42.50 The ideal loud speaker for homes, offices and amateur stations. Will operate on a 6-volt "A" battery. Excellent construction and acoustically perfect.

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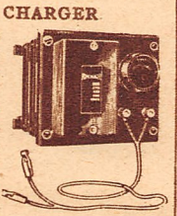
ANTENNA WIRE

R81 Solid bare copper wire No. 14..38c

R82 Stranded No. 22 copper wire.....65c

R83 Galena tested, guaranteed. Mounted.....25c

BATTERY CHARGER



R45 Price.....$13.25 Charges your battery at the cost of a few cents. Simple connections. Requires no attention. Make money with this battery charger recharging your friends' radio batteries. This charger is the best known and most reliable on the market. Genuine Home Charger

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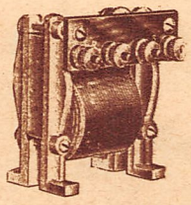

R75 Acme Type. Price.....$3.95 Gets long distance stations loud and clear. Reduces static and interference. Permits easy, sharp tuning. Gives excellent results with any standard tube. Makes set sensitive enough to use loop aerial. Perfectly shielded. Suitable for panel or base mounting.

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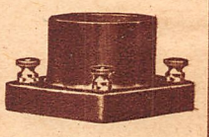
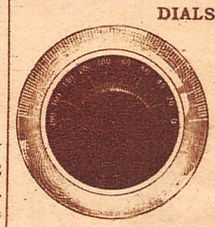


R87 Price.....50c Manufactured especially for us. A truly wonderful value. Moulded composition with nickel-plated binding posts. Phosphor-bronze spring contacts.

DIALS



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R89—3" diameter.....60c

R90—3½" diameter.....65c

R91—4" diameter.....$1.10

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R104 Baldwin "C" single units..... 7.50

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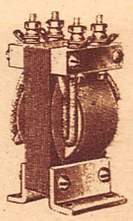

R150 Thoradson Price.....$3.75

R151 Acme Price.....$3.95

R152 Federal Price..$5.95

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Radio and Aircraft as Relief Agencies

By S. R. WINTERS

AIRCRAFT and radio-communication, as future allies of service, recently demonstrated their possibilities when the exigencies of floods threatened disaster. The Rio Grande River, with its turbulent waters rebelling against bank confinements, jeopardized life and property along a portion of the Mexican border; the angry stream was traveling at a rate of five miles an hour. The Air Service of the United States Army, with radio-equipped airplanes, detailed a fleet of air-going machines to the flooded area for the purpose of warning all persons in the danger zone of the menacing attitude of this river.

Emergency flight orders were promulgated and issued to officers at Kelly Field to proceed to the airdome at McAllen, Texas, reporting to the commanding officer at Camp McAllen for further instructions and duty. These orders were issued from the Wing Operations Office at Kelly Field at 4.31 p. m. and twenty-seven minutes later, on the same day, a formation of three air-going machines was moving toward the Mexican border. The orders were received when the hangars were closed and operations had closed, owing to the movement of the attack group within the field.

The Rio Grande Valley had just sustained a flood of no mean proportions, the result of torrential rains in the mountains around Monterrey, causing the San Juan River to become violent in its action. The latter stream empties into the Rio Grande River immediately above Rio Grande City. Gulley-washing and trash-moving rains above the valley for a period of ten days had contributed to the swelling flow of the San Juan River, forcing the Rio Grande River out of its banks. The water was spreading over the American and Mexican sides of this international stream, its overflow ranging from five to twenty miles in breadth. The river, with its drainage canals, is between six and eight miles wide at Mission, Texas.

The fleet of aircraft commissioned into service as a means of alleviating the apparent dangers of the flood, established radio-communication with headquarters at Camp McAllen, reported daily the progress of the flood. The formation of air-going machines forged ahead of the crest of the water and dropped messages to the ground warning the residents along the stream of the approach of the rushing waters. Meanwhile, the Rio Grande River had attained a height in excess of fifty feet in places, sweeping before it bridges and buildings. Daily reports from airplanes by wireless communication kept the outside world informed as to the extent of the menacing waters. For instance, one "radiogram" reads: "There are no families in the vicinity of McAllen on the Rio Grande that are marooned without a boat." Another message impinged on electromagnetic waves reads as follows: "The crest of the flood has not yet reached Mercedes, and warnings have been given to the farmers in this vicinity."

A similar public service was rendered to the flood-stricken inhabitants of Pueblo, Colorado, last year when aircraft and wireless facilities were functioning as side-partners. A fleet of flying machines was dispatched from Post Field at Fort Sill, Oklahoma, for the purpose of foreshadowing the conditions of the flood, instantly warning the citizens of the community if a further rise of flood waters appeared imminent. Life and property were thus safeguarded.

Airplanes and radio-telegraph and telephone outfits, once dedicated to the ends of war and its carnage, are becoming increasingly useful in the promotion of peace-time pursuits. The exigencies of disasters particularly suggest their service as rapid means

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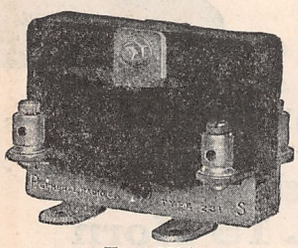

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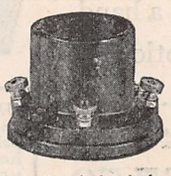

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of communication. A notable instance is the recent distressing circumstances incident to the turbulence of the Father of Waters. Radio-communication facilities on board airplanes could have been employed in issuing calls for relief. The exigencies of a prairie conflagration or forest fire are already being served by this mode of swift communication. Similarly summons for aid from a city in distress to another could be readily issued when aircraft and radio communication are functioning as allies of service.

The Strange Case of the Fires on the Roof

A MYSTERY SOLVED BY RADIO DETECTIVE

By CARL H. BUTMAN

WHAT caused the roof of one of the buildings of the Navy's farm at Greenberry Point near Annapolis to catch fire repeatedly, was a mystery, the solution of which required the services of a radio expert.

After three or four small conflagrations broke out on the roof of a wooden building used to house hogs, an inspection of the shingled roof revealed the fact that the wood around many of the nails was charred. In other places, where the wooden timbers came in contact with the ironwork, charred and burnt places were also discovered, but the fire fighters of Annapolis were unable to determine the cause.

When an officer of the great radio station, which incidentally is the most powerful in this country, heard of the fires, he decided to take a "look see." His inspection revealed the fact that many of the iron shingle nails were actually hot, and that the iron members of the structure were as warm as if they were connected with a heating system. Sitting on the roof, the "Radio Detective" pondered, and, looking aloft, observed that the great aerials of the station stretched directly over the building.

Immediately he recalled how the hair of radio operators in certain stations was frequently known to stand on end without any causative fear on the part of the operator. He also remembered that radio men sometimes suffered from hot feet while on duty, and cases where the nails in such men's shoes had all but melted, necessitating that they eliminate the iron nails or substitute rubber soles.

The "hair-raising" instance was due to static electricity induced by nearby antenna leads charged with high potential. The iron nails in the shoes of operators, who stood on ungrounded metal floors or over iron plates, got hot like transformer plates, because of currents induced in the metal by overhead coils. Mathematically combining two and two, the radio officer had the voltage of the sending aerials reduced, proving his theory when the fires on the farm building roof ceased.

It was an unusual case and one not likely to occur anywhere in this country, or at Annapolis again, for that matter. This transmission station, which is ten times as powerful as NAA at Arlington, is a 500 KW station, with fully 300 amperes in the antenna when sending. The aerials form a giant grid-iron, approximately a mile long and a quarter of a mile wide, held aloft by six 600-foot towers. Its power is indicated by its radius of transmission on 17,170 meters, which is 6,000 miles, messages reaching beyond the Red Sea, even in the summer. When transmitting at full power, a tremendous electric field is set up and any iron masses below or in close proximity with the antenna grid are affected electrically.

For purposes of economy, some of the Annapolis farm buildings were placed in the expanse of land under the aerial. As the iron shingle nails and iron framework of the

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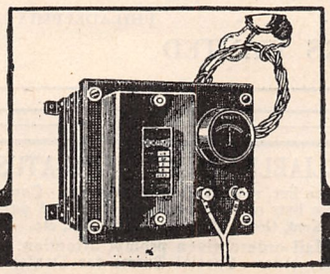

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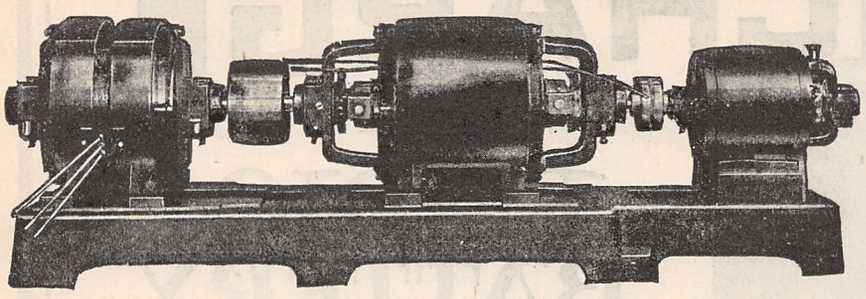

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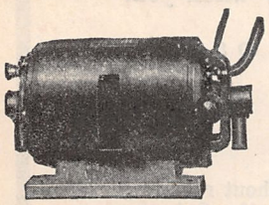

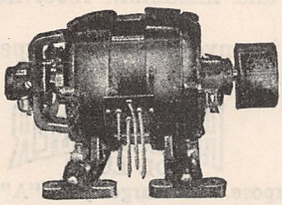

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building were not grounded, consequently the electric field in the antenna set up eddy currents in the metal, heating it until the wood in contact became charred and finally burst into flames. With less power in the antenna the fires ceased, the field not being strong enough to heat the metal to the kindling temperature of wood, just as the radio officer figured out.

The trouble was all eliminated by using copper nails in the building and grounding all structural metal. The ground wires act as ground leads on receiving aerials, carry the induced currents or lightning to the ground, and prevent heating.

Statement

Of the Ownership, Management, Circulation, Etc., Required by the Act of Congress of August 24, 1912, of RADIO NEWS published monthly at Jamaica, L. I., N. Y., for October 1, 1922.

State of New York } ss.
County of Queens }

Before me, a notary public in and for the State and county of Queens, and authorized to act in and for the county aforesaid, personally appeared Hugo Gernsback, who, having been duly sworn according to law, deposes and says that he is the Editor of the RADIO NEWS, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper the circulation), etc. of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business managers are: Publisher, Experimenter Publishing Co., 53 Park Place, New York City, N. Y.; Editor, Hugo Gernsback, 53 Park Place, New York City, N. Y.; Managing Editor, Robert E. Lacault, 53 Park Place, New York City, N. Y.; Business Manager, R. W. DeMott, 53 Park Place, New York City, N. Y.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent. or more of the total amount of stock.) Experimenter Pub. Co., 53 Park Place, New York City, N. Y.; Hugo Gernsback, 53 Park Place, New York City, N. Y.; Sidney Gernsback, 53 Park Place, New York City, N. Y.; R. W. DeMott, 53 Park Place, New York City, N. Y.; H. W. Secor, 53 Park Place, New York City, N. Y.; Dr. T. O'Conor Sloane, 53 Park Place, New York City, N. Y.; Mrs. Catherine Major, 53 Park Place, New York City, N. Y.; M. M. Finucan, 720 Cass St., Chicago, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest, direct or indirect, in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is ..... (This information is required from daily publications only.)

H. GERNSBACK, Editor.

Sworn to and subscribed before me this 27th day of September, 1922.

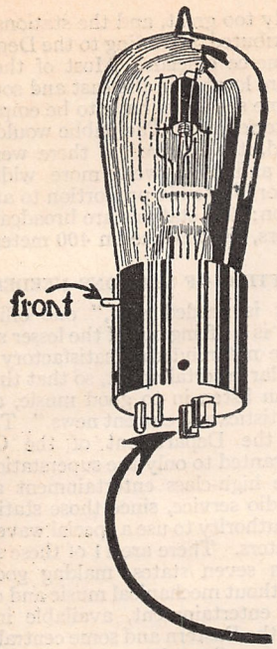
(SEAL) JOSEPH H. KRAUS.

Notary Public, Queens County Register No. 2951; New York County Register No. 3337; New York County Clerk's No. 439. (My commission expires Mar. 30, 1923.)

BROADCASTING INCREASES FIVE-HUNDRED FOLD IN YEAR. STATIONS NOW IN EVERY STATE—ONLY 23 OUT OF 558 LICENSES LAPSE

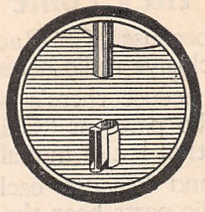
By WASHINGTON RADIO NEWS SERVICE

THERE were 546 broadcasting stations in the country on October 5; one or more in every state of the union. These stations supply radio enthusiasts with all the entertainment, news, government data on weather, agriculture, health, and other subjects that they can listen to all day and far into the night. But the total of 546 stations



We have in stock fuses for these tubes: Electron Relay, A-P Amplifying, Double Filament Audiotron, Cunningham C300 and C301, Radio Corp. UV200, UV201, UV202, and Western Electric UT1 and UT2.

When ordering state what tube fuses are wanted for.



Right Where the "Juice" Goes In

BECAUSE it is not on the panel or at a point on the "A" circuit that leaves the filament still exposed to a "short," but right where no excess current whatever can pass it the

RADECO SAFETY FUSE

(Pat. Pending)

gives *absolute protection* against "burning out" your Vacuum Tube filament. Not a guesss work "wrinkle" but a scientifically-designed protection device now in use on thousands of sets throughout the country.

Fits any standard bulb used in any standard socket, and absolutely does not affect efficiency of the set.

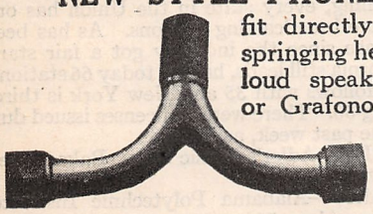
Come in Standard Package of

4 for $1

At Your Dealers or by Mail

CAUTION:
Do not force fuse on filament terminals. If contact solder is rough, file or sand-paper down so that fuse slips on easily. Filament terminals are the two farthest from the locking projection on base of tube.

NEW STYLE PHONE ADAPTERS

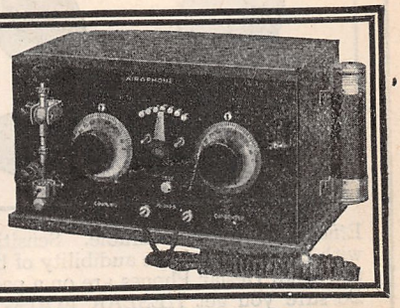


fit directly on phones without springing headpiece and attach to loud speaker of Victrola or Grafonola - - - - **$2**

Add postage on 2 lbs.

CRYSTAL SET

biggest value on market. Has Var. Condenser, Vario Ccupler, Tapped Primary, Buzzer, Cord Tipped Jacks, Bakelite Panel **$20**



45V VAR. UNIT "B" BATTERIES - $3.60

KEYSTONE ARRESTERS - - - - - $1.20

We Carry Only Standard Goods at Standard Prices

RADIO EQUIPMENT CO.

630 Washington Street Boston, Mass.

New England's Oldest Exclusive Radio House

Order from any Standard Catalog

Why they come to "Chi-Rad"—

—because "Chi-Rad" is the largest and oldest exclusive radio house in the middle west.

—because there's no difficulty in getting those radio parts at "Chi-Rad". (Just take a look at that list of manufacturers below.)

—and because each and every one of those radio parts bear the ever-satisfying guarantees of reputable manufacturers and of "Chi-Rad."

A few "Chi-Rad" Specials—

Moulded Variometer	$6.50
Moulded Variocoupler	6.50
Wooden Variometer	4.00
Wooden Variocoupler	3.00
Storage "B" Battery per cell (see description)	.50
Storage "B" Battery 22½ V section	6.00
"A" or "B" Storage Battery Charger	1.90
Lefax Radio Handbook	3.50

Write for your free copy of our new catalog—in it you will have no trouble finding just what you want.

Distributors for

Amer. Radio & Research Corp.
Acme Apparatus Co.
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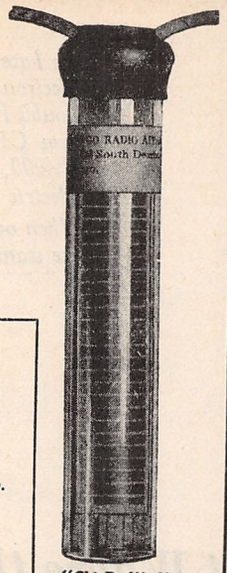
Remler Radio Mfg. Co.
Westinghouse Elec. & Mfg. Co.
Pacent Elec. Co.
Electrical Research Laboratories
Mu-Rad Laboratories, Inc.
Lefax, Inc.

Dealers: — Write for territory and discounts on "Chi-Rad" Specials, there's a big demand.



"Chi-Rad" New Storage "B" Battery

For receiving apparatus as source of plate voltage for both Detector and Amplifier tubes, rechargeable. Will operate on detector tube over 1000 hours with one charge. Not suitable for "A" battery use. 2 volts, price per cell $0.50. 22 volt section complete with base. $6.00

CHICAGO RADIO APPARATUS CO., Inc.

415 S. Dearborn St. CHICAGO, ILL.

Heslar Radio Makes The World Your Neighbor

HESLAR Equa-Tone PHONES

for clear Radio Reception

2200 Ohm..$10
3200 Ohm.. 12

Efficient, attractive, durable. Sensitive Heslar Phones register the most delicate sounds with clearness and the audibility of both phones is precisely the same. Comfortable to the head, Heslar Phones are on a par in every way with the most expensive head sets. Be sure you get HESLAR EQUA-TONE PHONES. You will notice a difference.

HESLAR RADIO CORPORATION, INDIANAPOLIS, U. S. A.

RADIO

Crystal Receiving Set	$7.50
Variocoupler	4.00
Variable Condensers, assembled, 3 plate,	1.75
" " " 11 "	2.75
" " " 23 "	3 25
" " " 43 "	4.25
Radio Clips, per gross	2.50

Above prices prepaid if your dealer cannot supply you

McCORKLE ENSIGN CO., 405 Erie St., Elmira, N. Y.

TIMES APPLIANCE CO., INC.
145 WEST 45th STREET, NEW YORK
WHOLESALE ONLY
Radio Parts, Sets and Equipment of All Kinds
Send for Our Price Schedule. Will Ship to Any Part of the U. S. and Canada

is literally too great, and the stations are not well distributed, according to the Department of Commerce officials. Most of the broadcasters are located in the east and southwest, where time schedules have to be employed to avoid interference. The public would be better served, it is believed, if there were fewer stations and they were more widely distributed or located in proportion to areas and population; 535 stations are broadcasting on 360 meters, the balance on 400 meters.

SIFTING OF STATIONS NEEDED

"What is needed now," one official explained, "is a sifting out of the lesser stations, which are not rendering satisfactory service and popular entertainment, so that the Radio Public can listen in to good music, authoritative statistics and current news." The creation by the Department of the Class B license, granted to only the superstations, will guarantee high-class entertainment and excellent radio service, since those stations are granted authority to use a special wave-length of 400 meters. There are 11 of these stations located in seven states, making good programs, without mechanical music and cheaper forms of entertainment, available in practically all the Eastern and some central states, where the fans listen in on 400 meters, watching local papers for the daily programs.

The 535 stations operating on 360 meters will have to look to their programs, as public opinion will indicate which of them are to continue in service for any length of time. The operating expense is so high that eventually only the good ones with sound backing will remain.

In September, 1921, the Department of Commerce licensed WBZ, WJZ, and KDPM, three Westinghouse Electric stations, to broadcast at Springfield, Mass., Newark, N. J., and Cleveland, Ohio, which are still active today. During the next two months, October and November, the Detroit *News*, WWJ, and the Westinghouse station at East Pittsburgh, KDKA, were licensed, and then in December "the fun began"—23 stations were licensed, and, although January saw the addition of only eight, in February there were 24 new licenses issued; 77 in March; 76 in April; and in May the peak of the radio curve was reached with 97. Since then the number of licenses issued has fallen off slowly each month as follows: June, 72; July, 76; August, 50; until in September there were but 39 stations granted licenses. This, a government radio inspector says, is due to the fact that the saturation point is reached—there are enough regular broadcasters. Many of the larger, mostly the older, stations are seeking Class B licenses, but not many such licenses will be granted, due to the qualifications laid down and the program requirements.

BROADCASTING IN EVERY STATE

With the issuance of a license in Laramie, Wyoming, every state in the Union has one or more broadcasting stations. As has been the case since the industry got a fair start, California still leads, having today 66 stations; Ohio follows with 35 and New York is third, having 30. There were 11 licenses issued during the past week, as follows:

KFDA—Adler's Music Store, Baker, Ore.; 5 watts.

WMAV—Alabama Polytechnic Institute, Auburn, Ala.; 750 watts.

WRAU—Amarillo *Daily News*, Amarillo, Texas; 20 watts.

WMAU—Louisiana State Fair Association, Shreveport, La.; 50 watts.

KFEC—Meier & Frank Co., Portland, Ore.; 100 watts.

WMAT—Paramount Radio Corporation, Duluth, Minn.; 400 watts.

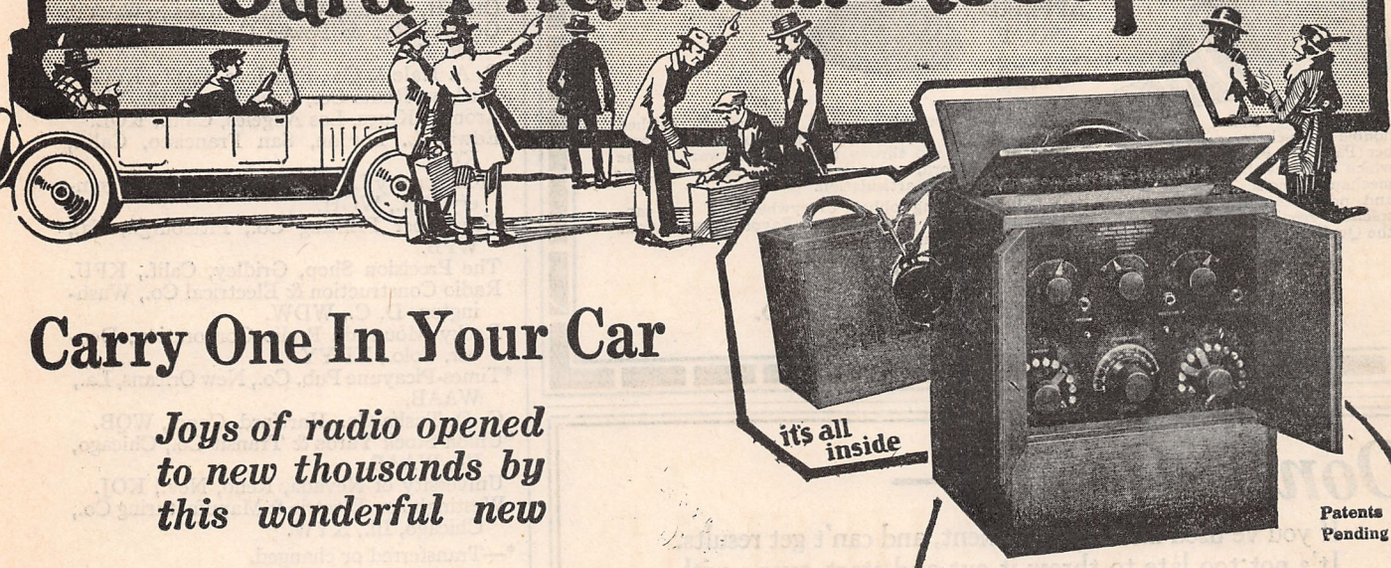
WNAG—Rathert Radio & Elec. Co., Cresco, Iowa; 45 watts.

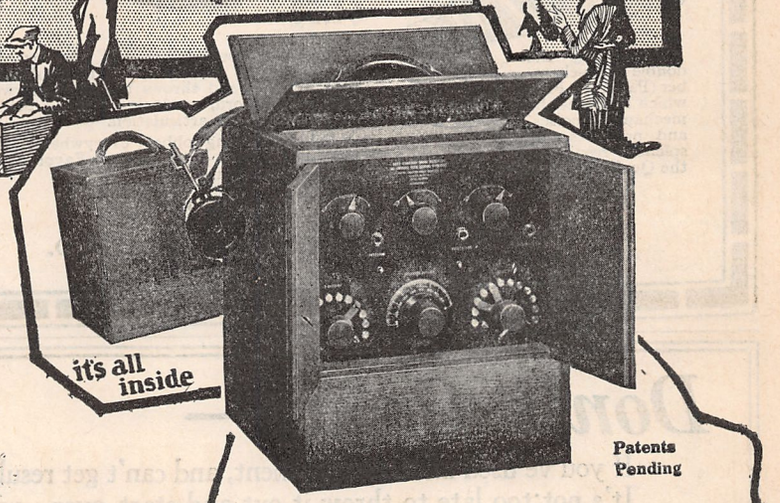
WMAQ—The Fair Corporation & The Chicago *Daily News*, Chicago, Ill.; 1,500 watts.

KFBU—Bishop N. S. Thomas, Laramie, Wyo.; 10 watts.

no ground no aerial

The Oard Phantom Receptor





Patents Pending

Carry One In Your Car

Joys of radio opened to new thousands by this wonderful new

A-P Set

Many people live in locations where an aerial is impossible or undesirable. Many object to their premises being disfigured by poles and wires. And others doubt their ability to operate sets with such complications.

The **Oard PHANTOM Receptor** removes these objections and opens the delights of radio to these thousands of people. It requires neither aerial nor ground connection. For general reception, only a single short antenna wire is necessary. This may be laid on the ground or floor, concealed in the picture moulding, or placed wherever most convenient. For distant reception a single antenna wire not exceeding 50 feet in length will give better results than other types of receivers requiring ground connections and elaborate aerials or loop systems. The **Oard PHANTOM Receptor** is highly selective, enabling the operator to eliminate static and other interference almost entirely. It is a marvel of beauty, simplicity and efficiency. With equal ease and facility it performs over short or long distances, in bungalow, business office, apartment house, or speeding automobile.

Ask your dealer to demonstrate. Get an **Oard PHANTOM Receptor** for CHRISTMAS. If he does not have it, write us for Bulletin N-3, mentioning his name.

Performing New Feats Every Day

Every day some enthusiastic owner sends us word of new achievements of this wonderful A-P set. On September 13th Mr. J. F. Carpenter, "9ZAF," Denver, Colorado, received the Dinwoody Institute, Minneapolis, 700 miles away, using only a piece of lamp cord about 30 feet long with his **Oard PHANTOM Receptor.** Some of the other stations heard by Mr. Carpenter include:

9ZN	Chicago, Ill.	900 miles
5XA	Auburn, Ala.	1050 miles
7QD	Aberdeen, Wis.	800 miles
8EK	Rochester, N. Y.	1300 miles
9BXK	Louisville, Ky.	1000 miles
6KA	Los Angeles, Cal.	800 miles

Another PHANTOM enthusiast, Mr. Paul Schulz of Stockton, California, ardently declares:

"The performance of the instrument is truly wonderful. I have handled every type of circuit generally known, and I have never yet found the equal of the PHANTOM. Its selectivity and ease of handling make it without parallel."

DEALERS and JOBBERS write

Atlantic-Pacific Radio Supplies Co.

Radio Supplies 646 Mission St. San Francisco Receiving Sets

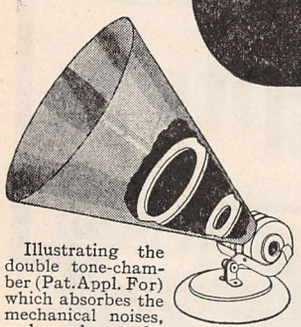
Qualitone

LOUD SPEAKER
WITH THE
DOUBLE TONE-CHAMBER

NO. 1 HOLDS TWO PHONE RECEIVERS
$4.50

NO. 1R HOLDS ONE PHONE RECEIVER
$4.50

PATENT APPLIED NO. 1
$4.50



Illustrating the double tone-chamber (Pat. Appl. For) which absorbes the mechanical noises, and produces the splendid results which have made the Qualitone popular.

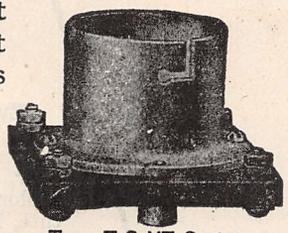
Made of tough fibre and hard wood, finished throughout in mahogany. The double tone-chamber amplifies and throws the sound forward to the bell of the horn, producing a rich, mellow quality of tone and clear articulation.

Sold by leading jobbers everywhere. If you cannot secure one, order direct. Favor us with your local dealer's name.

THE DUAL TOOL CO.
SUPERIOR AVE. & E. 124, CLEVELAND, O.

Don't Growl—

If you've used inferior equipment, and can't get results. It's not too late to throw it out and start over—with *Ace* material. If you have put up with poor service the past season—get started right this fall with *Ace* apparatus. Our socket illustrated herewith is a suggestion. Not a molded proposition to melt at the first touch of a soldering iron, but a base of ¼" solid sheet Formica, with die cast shell and absolutely guaranteed. Grid leak incorporated in socket base—adjustable to suit tube—and the price as low as consistent with highest quality. We make complete receiving sets and numerous small parts—literature on request.



Type T-S VT Socket
$1.50 with Grid Leak

ADDRESS DEPT. H-P

The Precision Equipment Company
2437-2439 GILBERT AVENUE, CINCINNATI, OHIO

BAKELITE-DILECTO PANELS

STANDARD PANELS 3-16 INCH THICK

GENUINE BAKELITE-DILECTO IS SPECIFIED BY THE NAVY AND BY LEADING MANUFACTURERS. IF YOU WANT BEST RESULTS DON'T USE A SUBSTITUTE. TUEX PANELS ARE CUT VERY ACCURATELY WITH SMOOTH, SQUARE EDGES.

6X7 $1.05 6X12 $1.80 6X14 $1.75
6X18 $2.25 6X21 $2.60 9X12 $2.25
7X10 $1.50 7X12 $1.75
7X19 $2.65 12X14 $3.50
12X18 $4.50
12X21 $5.20

SPECIAL SIZES ACCURATELY CUT. 1-8 IN. 2c PER SQ. IN.; 3-16 IN. 3c PER SQ. IN.; 1-4 IN. 4c PER SQ. IN.

ANY PANEL SHIPPED C. O. D. OR POSTPAID ON RECEIPT OF CHECK OR MONEY ORDER. MONEY BACK IF NOT SATISFIED.

TUEX SUPPLY CO. 1429 State St. Bridgeport, Conn.

The Third Edition of the **Amateur Radio Call Book** is now off the press. A Complete List of Amateurs, Broadcasting and Special Amateur Stations of U.S. and Canada. Also large map 25x38 printed in 2 colors of U.S. and Canada showing every Broadcasting Station.

Price $1.00 per copy
RADIO DIRECTORY & PUBLISHING CO.
45 Vesey Street, Room 103, New York
Do Not Send Stamps

WMAR—Waterloo Electrical Supply Company, Waterloo, Iowa; 50 watts.

WQAQ—West Texas Radio Co., Abilene, Texas; 60 watts.

FEW BROADCASTERS HAVE QUIT

Of the 558 broadcasting stations licensed, 23 only have fallen by the wayside, so to speak, and some of those were deleted from the department's active list because of the amalgamations of two stations in the same district or the transfer of a station, in which cases the service did not stop.

BROADCASTING STATIONS DROPPED OR CHANGED

Modesto *Evening News*, KOQ.
The Beacon Light Co., Los Angeles, Calif., KNR.
*Robert E. Compton, Quincy *Whig Journal*, Quincy, Ill., WCAZ.
St. Louis Chamber of Commerce, WAAE.
Irving S. Cooper, Los Angeles, Calif., KZI.
The Fair, Chicago, WGH.
Domestic Electric Co., Brentwood, Mo., WFAK.
Y. M. C. A., Berlin, N. H., WEAQ.
Electric Lighting Supply Co., Hollywood, Calif., KGC.
Otto H. Taylor, Wichita, Kans., WAAT.
Georgia Ry. & Power Co., Atlanta, Ga., WGM.
O. A. Hale & Co., San Jose, Calif., KSC.
Karlowa Radio Co., Rock Island, Ill., WOC.
Aron A. Klugs, Los Angeles, Calif., KQL.
Edwin L. Lordon, San Francisco, Calif., KGB.
Montgomery Light & Power Co., Montgomery, Ala., WGH.
Newspaper Printing Co., Pittsburgh, Pa., WPB.
The Precision Shop, Gridley, Calif., KFU.
Radio Construction & Electrical Co., Washington, D. C., WDW.
Rocky Mountain Radio Corporation, Denver, Colo., KDYY.
*Times-Picayune Pub. Co., New Orleans, La., WAAB.
C. D. Tuska Co., Hartford, Conn., WQB.
*Union Stock Yards & Transit Co., Chicago, Ill., WAAF.
University of Nevada, Reno, Nev., KOJ.
Westinghouse Electric & Manufacturing Co., Chicago, Ill., KYW.

*—Transferred or changed.

AMATEURS STILL INCREASING

The interest in radio has also been demonstrated by the applications for amateur transmitting stations, of which there were 16,467 on September 1, 1922. On June 30, 1921, there were but 10,809 amateurs authorized to send radio communications, but since that time, 5,658 more have been added to the ranks using 200 meters.

THE FIRST AIRPLANE BROADCASTING STATION

A radio-equipped flying boat will broadcast news of the National Airplane Races at Detroit on October 9. Listen in on 507 meters and get the first radio report on an aviation meet! A high-powered flying boat, recently christened the "Wilbur Wright" by Miss Katherine Wright, sister of the "Fathers of Flying," has been equipped by the General Electric Company with a 50-watt radio transmitting set, which will have a range of 100 miles. Reports from this aircraft will be sent out on a wave-length of 507 meters, a length not too great for even the small crystal sets to tune to. Soaring at a height of 3,000 feet, this flying boat will observe the contestants in the various events and will give radio reports on the progress of the races. Special receiving sets will be placed about the flying field so that spectators can be informed at all times as to the position of the planes, even when they are out of sight.

ARMY TANK DIRECTED BY RADIO

One of the new Signal Corps radio sets designed for the whippet tanks of the army

MAKE A SET—SAVE MONEY

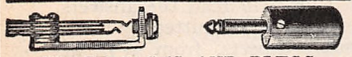
Who Gets the Best Results? The Fan Who Built His Set!

Our Policy:—Standard Quality Merchandise at Low Prices. Order and be convinced.

We Pay Express or Postage in the United States East of the Rockies (Except Storage "A" Batteries)

PHONES

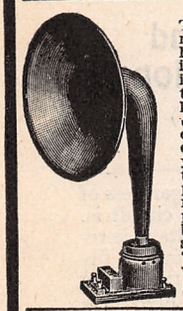
Genuine Frost and Brandes head sets complete with cords.
Frost N162—Double head sets, 2000 ohm. $4.45
Frost N163—double head sets, 3000 ohm. 5.40
Frost N164—Single head sets, 1000 ohm. 2.60
Frost N165—Single head sets, 1500 ohm. 3.10
Brandes Superior N166—Double head sets, 2000 ohm 7.20



FROST JACKS AND PLUGS

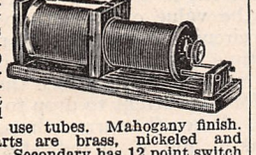
Jacks are polished nickel, nickel-silver springs, pure silver contacts. Nickel washers for mounting on any panel ⅛ to ½ inch thick. Spread terminals make soldering easy.
N133—One spring (open circuit). Each. $0.46
N134—Two spring (closed circuit). Each. .56
N131—Four spring (two closed circuits) Each ..... .70
N135—Three spring (two open circuits, commonly called "single circuit filament control"). Each ..... .80
N136—Five spring (two open and two closed circuits commonly called "two circuit filament control"). Each ..... .95
N132—Plug, telephone type with short knurled grip ..... .75
N137—Plug (as shown), best type plug for Radio panel work, cord tips fit into plug 1.05

MAGNAVOX



The Genuine R-3 Magnavox with the 14-inch horn still remains the ideal loud speaker for use in homes, offices, amateur stations, etc. This loud speaker is made on the electro-dynamic principle, one winding being excited by current from your 6-volt storage battery. This makes it possible for this instrument to amplify as it reproduces. Your "B" battery plate voltage should be 90 to 200 volts. "Radio brings it, Magnavox tells it."
N170 — Radio Magnavox $43.50

LOOSE COUPLER



This loose coupler is preferred by many because of its wide range—200 to 3500 meters. Permits the beginner to start with a crystal set and later use tubes. Mahogany finish. All metal parts are brass, nickeled and highly buffed. Secondary has 12 point switch mounted on Bakelite coil head. Windings are green silk-covered wire.
N800—Size, 5½x6x18 inch $6.80

CRYSTAL DETECTOR

A very high grade glass enclosed crystal detector including the crystal. All metal parts nickel plated. Adjustjustable to any point on the crystal.
N20—Enclosed crystal detector $1.40
A lower priced but nicely constructed detector. Crystal included.
N30—Detector ..... .88

GALENA CRYSTALS

Selected and tested galena. Each box contains enough for four to six crystals. Guaranteed satisfactory.
N12—Price, package 12c

SILICON CRYSTALS

Sensitive silicon crystals. Enough for four to six ordinary crystals.
N13—Price, package 12c

BINDING POSTS

Complete with screw and washer. All brass finished in polished nickel or with black composition top as listed. Order by number.

	Each	Doz.
N110—Large size, all nickeled	10c	95c
N122—Medium size, nickeled, with hole for phone tip or wire	5c	48c
N112—Medium size, black composition top	7c	75c
N120—Large size, composition top	8c	85c

SWITCH POINTS AND STOPS

Brass, polished nickel finish. Screw size, 6/32x⅝ ins. long, two nuts with each contact point and one with the stops. Stops high enough for any type of lever and point.

	Each	Doz.	Hundred
N130—Switch Point, diam., ¼ inch; height, 3/16 inch	3c	20c	$1.40
N150—Switch Stops	3c	20c	1.40

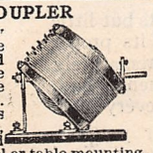
VARIOMETERS

For efficiency, perfect inductive ratio, low capacity effect and neatness of design these variometers are unexcelled. All metal parts nickeled brass. Tight spring bronze contacts will wear indefinitely. Accurately turned rotors and stators, mahogany finish. Completely assembled and tested. Wound with two sizes of wire—No. 18 and No. 20.
N1200—Variometer, No. 20 wire. Price, $2.95
N1300—Variometer, No. 18 wire. Price, 2.95

MOULDED TYPE VARIOMETER

For those who want the round black moulded composition type, we offer the following high grade variometer. Metal parts nickel plated.
N1220—Moulded Variometer $5.95

180° VARIOCOUPLER



The primary and secondary windings of this coupler are properly proportioned and spaced. The center of the secondary is always in the center of the primary field. Unlike most couplers, it aids in tuning. Black fibre base, brown formica tube, and nickeled metal parts. Panel or table mounting.
N1100—Coupler $3.25

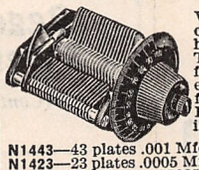
180° MOULDED ROTOR TYPE COUPLER

The following 180° variocoupler has heavy black tube 3/16 inch thick and moulded rotor ball. Very similar to above coupler. Metal parts nickel plated. Furnished without base, but may be mounted on table or panel.
N1120—Variocoupler $4.75

OUR GUARANTEE

Your satisfaction guaranteed. If for any reason you do not feel satisfied with your purchase, you may return it and we will refund your money. We will pay return transportation charges.

VARIABLE CONDENSERS



Very best mechanical construction. heavy, hard aluminum plates. The vernier types are furnished with moulded dial and small knob for adjusting vernier. Plain types have ¼ inch shaft.
N1443—43 plates .001 Mfd. without dial. $2.90
N1423—23 plates .0005 Mfd. without dial. 2.50
N1411—11 plates .00025 Mfd. without dial 2.10
N1403—3 plates .00005 Mfd. without dial. 1.80
N1441—41 plates vernier .001 Mfd. with dial 4.95
N1442—21 plates vernier .0005 Mfd. with dial 4.25

RADIO FREQUENCY AMPLIFYING TRANSFORMER

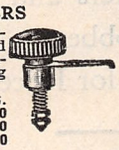
Radio frequency transformer circuits help to eliminate static and interference, thus permitting easy, sharp tuning of long distance stations. Enclosed in metal case for shielding and can be mounted in tube socket if desired. Wiring diagrams furnished with each transformer.
N1500—Transformer. Each $4.25

INDUCTION COILS

Rigidly wound, nicely finished, low distributed capacity. All coils are equipped with standard mountings. We can supply any of these coils without mounting plugs, for 55c less than the prices shown. The wave lengths shown are range limits, based on a variable condenser of .001 Mfd. capacity.

	Number of Turns	Wave Lengths	Price, Mtd.
N1725	25	125- 250	$0.95
N1726	35	175- 450	0.98
N1727	50	240- 720	1.05
N1728	75	390- 910	1.10
N1729	100	500- 1450	1.14
N1730	150	600- 2000	1.19
N1731	200	900- 2500	1.28
N1732	250	1200- 3500	1.38
N1733	300	1500- 4500	1.38
N1734	400	2000- 5000	1.50
N1735	500	2800- 6100	1.65
N1736	600	4000-10000	1.80
N1737	750	5000-12000	1.95
N1738	1000	7900-15000	2.30
N1739	1250	9750-19500	2.55
N1740	1500	14500-26500	2.70

SWITCH LEVERS



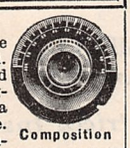
A high grade, polished nickel-plated lever with solid moulded black composition knob. Complete with panel bushing, spring and two nuts.

	Each	Doz.
N151—1 " Radius	30c	$2.80
N152—1¼ " Radius	32c	2.90
N155—1½ " Radius	35c	3.00

SPAGHETTI TUBING

For insulating cabinet wiring. Black finish. Three foot lengths.
N33—Per 3 ft. length 20c

DIALS



Genuine Bakelite Dial as pictured. Sharply engraved divisions and figures filled with a brilliant white. Three-inch diameter, with bushing for 3/16-inch or ¼-inch shaft. Set screws included.

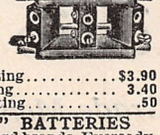
	Each	Doz.
N500—Dial	65c	$7 00
N550—Dial, 3/16-inch Shaft	40c	$4 50
N555—Dial, ¼-inch shaft	40c	4 50

Three-inch moulded composition dial as pictured. Has a luster that cannot be told from Bakelite. Set screws included.

AUDIO FREQUENCY AMPLIFYING TRANSFORMER

Correctly designed for minimum distributed capacity and low core losses, maximum amplification without distortion. Use 10-1 for Cunningham and Radiotron tubes; 3-1 for other makes. Fully mounted, cast aluminum feet, bakelite terminal panel.
N1510—Transformer, 10–1 ratio $3 75
N1503—Transformer, 3–1 ratio 3.70

INDUCTANCE COIL MOUNTINGS



For base or panel mounting. Connecting leads furnished, coil settings are adjustable by means of knobs. Made entirely of bakelite with nickeled brass metal parts. Coil position can be locked by knurled set screws.
N1603—Three coil mounting $3.90
N1602—Two coil mounting 3.40
N1601—Single coil mounting ..... .50

"B" BATTERIES

Standard brands, Eveready, Burgess or Franco. State choice.
N230—22½ volt Signal Corps type. Size 3½x2½x 2½ inch. Price $1.26
N235—22½ volt U. S. Navy variable—5 positive taps. Size, 5x3x2½. Price $1.98
N240—22½ volt large variable—5 positive taps. Size, 6½x4x3. Price 2.25

CABINETS

These are reasonably priced but sturdily built cabinets of weathered oak. The top is removable by loosening four screws. End posts are routed to take panel 3/16-inch thick. The panels are not included.
See table for panel lengths.
N212—Can be used for detector and two step. Panel space, 5½x14 ..... $2.50
N214—Can be used for 2 variometers and 1 coupler. Panel space, 5½x14 ..... 2.75
N218—Can be used for 2 variometers, 1 coupler and detector. Panel space, 5½x18 3.00
N222—Can be used for 2 variometers, 1 coupler, detector and 2 step. Panel space, 5½x22 ..... 3.25

PANELS

Genuine Formica. Panels to fit our cabinets.
N262—Panel, 5½x12 inches 3/16" thick .. $1.38
N264—Panel, 5½x14 inches 3/16" thick .. 1.64
N268—Panel, 5½x18 inches 3/16" thick .. 2.08
N272—Panel, 5½x22 inches 3/16" thick .. 2.53

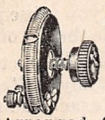
HOW TO ORDER

Order from this page. Please give number, description and price of the articles you order to help us avoid mistakes. Total the amount of your order and send Post Office money order, certified check or draft with your order. Be sure to give your name and street address on both letter and envelope. Do not include money for transportation. We pay it.

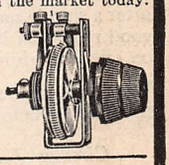
VACUUM TUBES

Genuine Cunningham Tubes made by the General Electric Co. Every tube guaranteed new and in original package.
N-C200—Detector $4.75
N-C201—Amplifier 6.35

VACUUM TUBE RHEOSTATS



This is a reasonably priced, smooth acting rheostat that will mount directly on back of panel. Bakelite arrow knob.
N1050—Rheostat 50c
Genuine Cutler-Hammer rheostats, we believe, are the best rheostats on the market today. Arranged for panel mounting. The picture shows the vernier type All metal parts nickeled



N1061—Vernier type C.H. Rheostat. $1.40
N1062—C. H. Rheostat without vernier. .95

SOCKET

This is an all metal socket. Cannot break when the tube warms up. Edge is tapped for panel mounting screws. Binding posts thoroughly insulated. Nickeled brass shell, phosphor bronze contacts.
N1075—Socket 50c

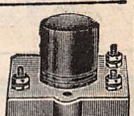
VARIABLE GRID LEAK

Pencil mark type. Removable black enameled cap.
N50—Grid Leak 22c

GRID AND PHONE CONDENSERS

Mounting holes spaced to fit screws of above Grid Leak. Mica insulation, wrapped with varnished cambric tape. Capacity, .00025 Mfd.
N55—Grid Condenser 18c
N59—Phone Condenser .001 Mfd. 25c

LIGHTNING ARRESTER OR PROTECTOR



Mounts indoors. Porcelain base, nickeled cover. Listed by the Underwriters' Laboratories under April, 1922, regulations.
N300—Protector $1.40

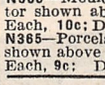
BRACH OUTDOOR ARRESTER

This is the genuine Brach No. 223 bell shaped vacuum gap outdoor arrester.
N323—Brach Arrester $2.80

ANTENNA WIRE

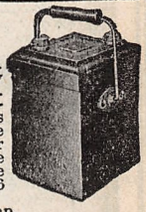
The following are 100 foot coils of 7 strand cable of No. 22 wire, which makes the best Aerial. Use phosphor bronze, where the span is 100 feet or more. It is stronger.
N350—Stranded Phosphor Bronze, 100 ft. $1.47
N355—Stranded Copper, 100 ft. ..... .77
N356—Single No. 14 bare solid Copper Wire, 100 ft. ..... .42

INSULATORS



These are very strong strain type Insulators.
N360—Moulded insulator shown above to left. Each, 10c; Doz. ... $1.10
N365—Porcelain insulator shown above to the right. Each, 9c; Doz. 95c

STORAGE "A" BATTERIES



Built of entirely new parts. With the proper care they should last several years. The De Luxe type has rubber case and cover for top as pictured, the Standard type has black wood case similar to ordinary automobile type. Guaranteed to give full rated capacity. All 6 volt batteries.

Number	Amp. Hour Rating	Shpg. Wgt.	Price
ND 60—De Luxe	60	40	$15.50
ND 80—De Luxe	80	50	17.50
ND100—De Luxe	100	62	20.50
NS 60—Standard	60	35	12.25
NS 80—Standard	80	40	14.25
NS100—Standard	100	50	16.25
NS110—Standard	110	60	18.25

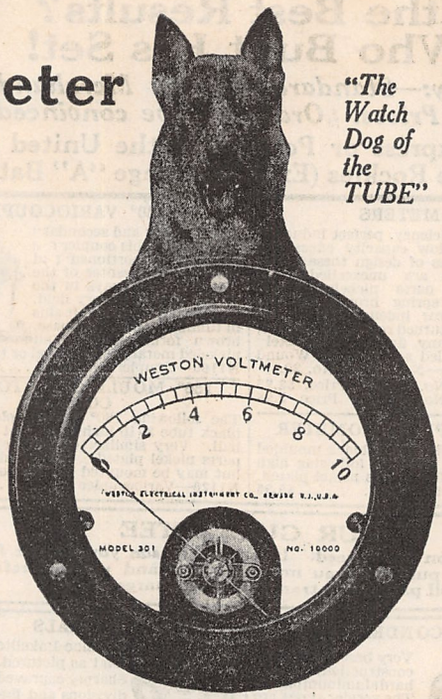
The above storage batteries are the only items on which we do not pay transportation charges. We will ship by Express.

HOMCHARGER

Charge your "A" battery at home for a few cents. Attach to any 110 to 125 volt, 60 cycle, alternating current light circuit by screwing plug into lamp socket. Will also charge 6 volt auto batteries. Approved by the Insurance Underwriters.
N1900—Homcharger. Price $16.25

GREAT LAKES RADIO CO., 1124 JACKSON BOULEVARD, CHICAGO, ILL.

A WESTON Filament Voltmeter *Why?*



"The Watch Dog of the TUBE"

BECAUSE a Weston Voltmeter costs but little more than ONE Vacuum Tube—and its proper use will save not only that tube from prematurely burning out, but all others you subsequently buy. Its use will double and treble the life of every tube.

BECAUSE with a Weston Voltmeter you can always duplicate instantly any voltage required for best results—and your exact tuning is thereafter a simple matter. For accelerated tuning and good reception it is therefore an absolute necessity on every receiving set.

Why not make this money-saving investment right now—before you lose another tube?

Circular J describes this voltmeter fully and also tells you of other important Weston instruments improving Radio Reception and Transmission. Write for it.

WESTON ELECTRICAL INSTRUMENT CO.
173 Weston Ave., Waverly Park, NEWARK, N. J.

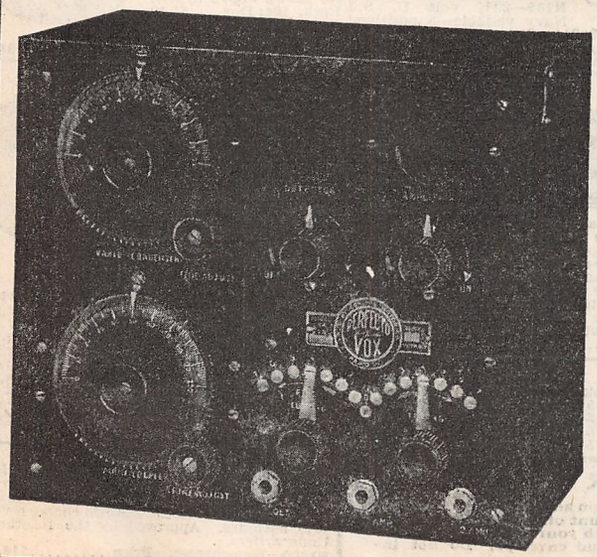
Makers of Electrical Instruments Since 1888

WESTON
"THE SUN NEVER SETS ON THE WESTON"
"STANDARD" THE WORLD OVER
ELECTRICAL INSTRUMENTS
An Indicating Instrument for Every Individual Need and Industrial Purpose

PERFECTO-VOX
(PERFECT-VOICE)

For the Radio Christmas

Quality in a High-Grade Medium-Priced Receiver
Non-Regenerative Detector—Two Step Amplifier
Filament Control Jacks



Price $90

Dealers and Jobbers Write for Prices

SCRIPPS MOTOR COMPANY
Radio Division
DETROIT, MICHIGAN

was tested out for the first time at the annual field day of the Army Ordnance Association at Aberdeen, Md., recently. The standard sets, designed for the master tanks of each group, include both telegraph and telephone apparatus. Under direction of the commanding officer in the rear the radio tank executed intricate orders immediately, charging and attacking enemy tanks directed solely from back of the lines. Observers report a most satisfactory test.

"ADVENTURE" TO ANSWER QUERIES BY RADIO

A novel use of radio broadcasting has just been announced by the magazine *Adventure*. In a series of radio talks, L. Patrick Greene, of the editorial staff, will read the answers to a number of questions submitted by readers to the *Adventure* experts, from WJZ at Newark twice a month.

Nearly fifty experts having first-hand knowledge of the far corners of the earth have been answering readers by mail but will now use radio. If "listeners-in" wish to know about Alaska, India, Borneo, Central Africa, or any other country, they are invited to mail their questions to the "Ask *Adventure*" man, care of *Adventure*, New York. When possible the answers to questions will be broadcasted but all will be answered by mail.

Regeneration and Super Regeneration

(*Continued from page* 1077)

quency of the impressed voltage, regardless of what the natural frequency of the circuit is.

When this applied oscillating voltage is removed the "forced oscillation" current decreases to zero according to the curve shown in Fig. 7, exactly as in the case of direct currents and for the same reason. The time it takes for the current to drop to zero depends largely upon the value of the effective resistance of the circuit. The greater the resistance the less time it takes for energy of the current to be consumed and hence the less time it takes for the current to drop to zero, and vice versa. When the current drops rapidly to zero, as in Fig. 4, it indicates that the circuit resistance is extremely high. The circuit is then said to be "highly damped" and the circuit has a "high decrement," and vice versa.

Thus far the action of the oscillatory circuit is the same for alternating currents as the action of the previous circuits described for direct currents. We now come to an important difference. An oscillatory circuit had a natural frequency of vibration or oscillation of its own. This natural period is determined by the value of the inductance and capacity in the circuit. If an instantaneous electrical impulse of any sort is applied to such a circuit it will vibrate—*i.e.*, an oscillatory current will flow through it and the frequency of this oscillation will be the same as the natural frequency of the circuit. Such an oscillation is called a "free oscillation." This free oscillation dies down to zero after the voltage pulse is removed for the same reason and in exactly the same way as the forced oscillation when the impressed voltage is removed.

Thus when an external voltage is applied to an oscillatory circuit, two oscillations result: One, a forced oscillation having the same frequency as the applied voltage, which oscillation lasts as long as the voltage is impressed; two, a free oscillation having the same frequency as the natural frequency of the circuit. While the forced oscillation persists during the time the voltage is impressed, the free oscillation dies out. These two oscillations are graphically shown in Fig. 8.

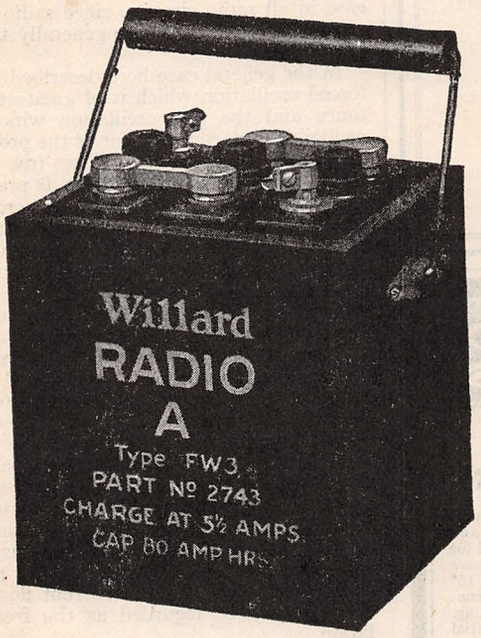
In place of the alternating current generator applying the impressed voltage to the circuit, we may consider the generator replaced by an antenna circuit inductively coupled to the

$13.60—That's All for a Willard "A" Battery

Here's a Christmas present that will go big, you can be sure —with yourself or anyone else who has a radio set.

It's a genuine Willard "A" Radio Storage Battery at the lowest price for which a Willard Radio "A" Battery has ever been sold.

And when we say genuine Willard we mean just that, for this new battery is fit in every detail to bear the name. We are no less proud of having been able to produce such a good battery to sell at such a low price than of being the makers of the popular Willard All-Rubber Radio Batteries, the last word in radio battery construction.



It's Made in 3 Sizes!

This new battery—the Willard FW—is of the 6-volt type and made in three sizes, 40, 80 and 110 ampere hour capacity. They are priced as follows: 40 a. h., $13.60; 80 a. h., $17.50; 100 a. h., $22.00. A slight addition to these prices is made in the extreme South and West of the Mississippi.

Why This is a Real Willard

It is made in the same plant and by the same men who make the higher-priced Willard batteries for both radio and automobile service, and they bring to it the same care, skill and experience.

It has Willard quality plates, selected wood separators, tested rubber jars, acid-proofed container.

It includes such features as special terminals to insure easily-made and tight connections, special marking for positive terminal; patented rubber gaskets to prevent leakage; a convenient durable roller-type handle, and other advantages.

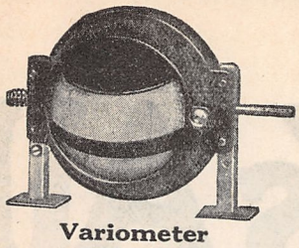
All Willard Radio Batteries, too, are shipped from the factory dry and fully charged, so that you always get a brand new battery and one that is ready for use just as soon as the acid solution is poured into it.

Go to the nearest Willard Service Station or your dealer's today and see this new Willard Battery.

WILLARD STORAGE BATTERY CO., Cleveland, Ohio

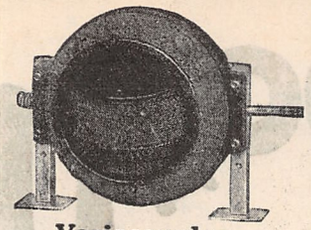
Made in Canada by the
Willard Storage Battery Company of Canada, Limited, Toronto, Ontario

Willard STORAGE BATTERY



Variometer
Price, $6.50

RPM



Variocoupler
Price, $6.50

High Grade

RADIO APPARATUS

Twenty years in the electrical manufacturing field gives us the experience, organization and equipment to produce the highest grade of radio apparatus on the market.

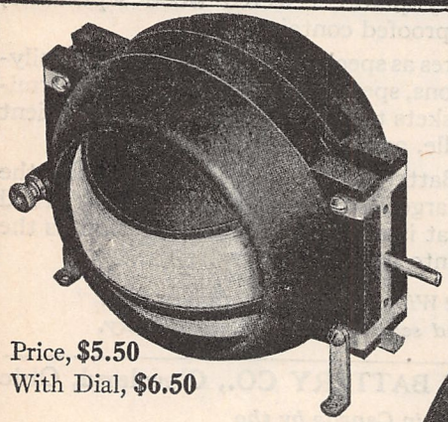
Each unit is made complete in our own plant—from the moulding to the winding, assembling and final testing of the completed instrument.

The apparatus shown above is moulded from Redmanol, which is unaffected by water, oils, acids or other elements. It is a material which increases in resistance and strength with age. All joints and terminals are soldered, insuring perfect contact in all positions. These instruments are built to give unqualified service and satisfaction.

Write us for full information. There are still a few territories open for jobbers specializing on radio equipment.

Radio Products Mfg. Co.
667 W. Fourteenth St.
Chicago, Ill.

COLUMBIA RADIO PARTS



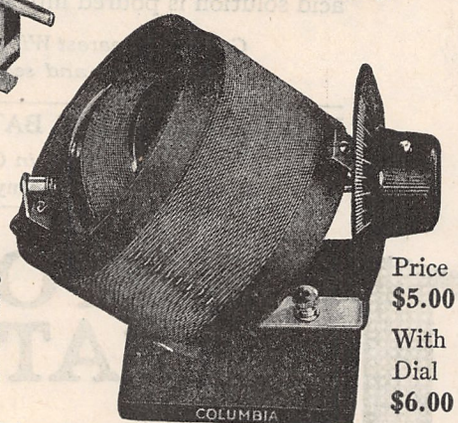
Price, **$5.50**
With Dial, **$6.50**

COLUMBIA MOULDED VARIOMETER

A *superior* instrument with the Stator and Rotor of *moulded hard rubber*. Accurate electrical and mechanical construction throughout; designed for *best values of maximum and minimum inductance* and minimum distributed capacity. Has 3/16" shaft, with spring tension to secure electrical contact. Adapted for both base and panel mounting. All metal parts highly nickeled. An essential radio instrument of beauty and efficiency.

COLUMBIA 180° MOULDED VARIOCOUPLER

A MOST efficient 180° coupler designed for sharp tuning from 150 to 650 meters. Stator made of a highly dielectrical composition. Rotor of *moulded* hard rubber; both wound with green silk covered wire. All metal parts nickel plated and mechanically correct. Ten taps are provided. Has 3/16" shaft with spring tension to insure electrical contact; base and panel mounting.



Price **$5.00**
With Dial **$6.00**

Columbia Apparatus will add beauty and efficiency to your outfit. **Variable Condensers, 23 plate, $3.50; 43 plate, $4.50. Bakelite or Hard Rubber Dial and Knob, $1.00.**

If your dealer does not stock our items, send your order direct

COLUMBIA RADIO CORPORATION

2756 Diversey Avenue
Chicago · Illinois

circuit as shown in Fig. 9. In this case the voltage impressed on the oscillatory circuit will be that due to the voltage induced in the circuit by the antenna signaling voltage. The forced oscillation in circuit II will have the same frequency as the antenna frequency and the free oscillation will have the frequency of circuit II. The value of these oscillations will be a maximum, however, when the two circuits are in "resonance"—*i.e.*, when the frequency of antenna circuit and circuit II co-

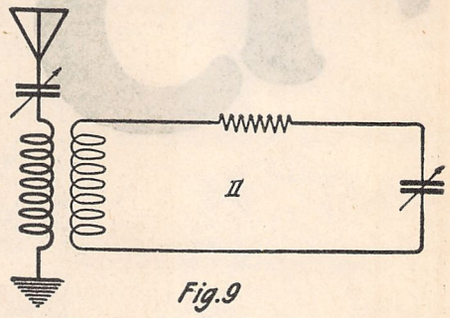


Fig. 9

This Shows the Equivalent of a Tuned Circuit Comprising Inductance Capacity and Resistance.

incide, just as the swing of two pendulums is a maximum when the pendulums are of the same length, have the same weight, etc. In this case the forced and free oscillations will have the same frequency. This is the general case in all radio circuits, since radio circuits coupled to each other are generally tuned to each other.

In the general case here described it is the forced oscillation which is of greatest importance and the free oscillation which is of negligible importance as far as the production of signals is concerned. The free oscillation, while it lasts a finite time, is practically instantaneous and dies down to zero, while the forced oscillation persists as long as the applied voltage (which is the received signal in the antenna) lasts, which is many times longer than the free oscillation.

Now, as the resistance of the circuit decreases, the oscillating current for a given voltage increases. When the resistance reaches zero the current has reached a very large value. If now the impressed voltage is removed, the current continues to flow in the circuit at the value it had when the voltage was removed. Once a current has been started in a circuit and the resistance reduced to zero, this current will continue to flow, regardless of the presence of an external voltage, since there is no resistance to consume its energy or "damp" the current. As there is no impressed voltage and current flows, this current may be regarded as the free oscillation.

Let us now consider the application of the above outlined principles to the regenerative receiver. In Fig. 10 is a circuit of a simple bulb receiver. The signaling voltage in the

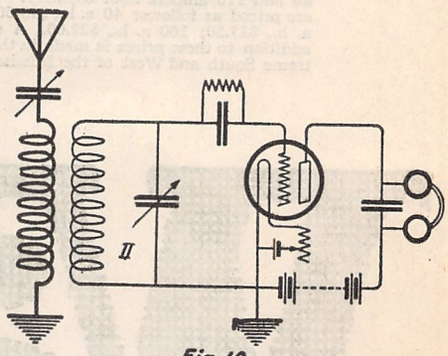
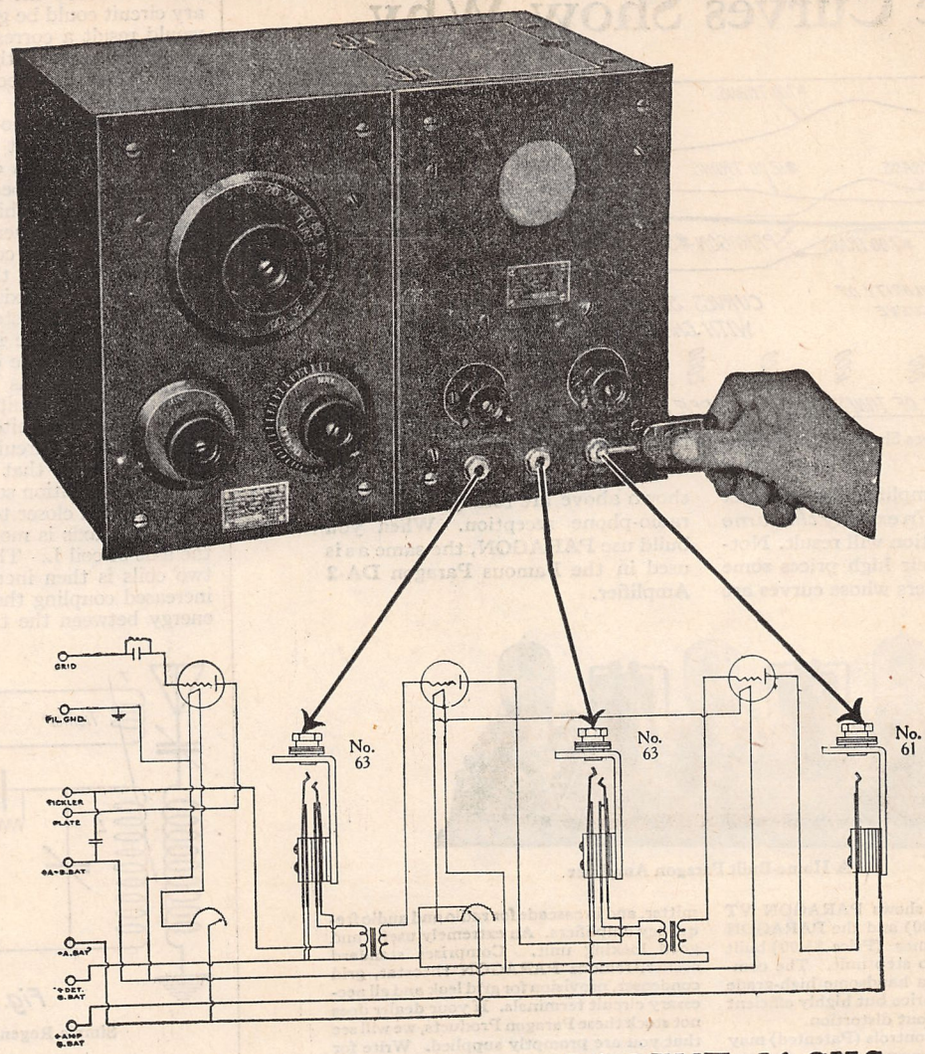


Fig. 10

Hook-Up of a Vacuum Tube Acting as Rectifier in a Receiving Circuit.

antenna is impressed by induction on the secondary circuit II and a free and forced oscillation will, therefore, flow in the secondary circuit. The free oscillation dies out in a very short period of time, as explained above,

PACENTIZED RADIO EQUIPMENT



Leading Authorities Choose PACENT JACKS

The Westinghouse R. C. set shown above is equipped with PACENT Jacks. The diagram shows the installation of the jack equipment. That experienced radio engineers have chosen PACENT jacks as standard equipment has a two-fold significance. It shows how exacting leading set manufacturers are, in standardizing on reliable radio parts. It shows how PACENT jacks meet the most exacting requirements.

Good sets are made BETTER with PACENT jacks.

Every PACENT product embodies the highest radio engineering skill and over fifteen years' practical radio experience.

DON'T IMPROVISE — "PACENTIZE"

Look for the PACENT Trade-Mark. It is your guarantee of QUALITY, ACCURACY and DEPENDABILITY in Radio Essentials.

Write for Descriptive Bulletins R. D. 106

PACENT ELECTRIC COMPANY

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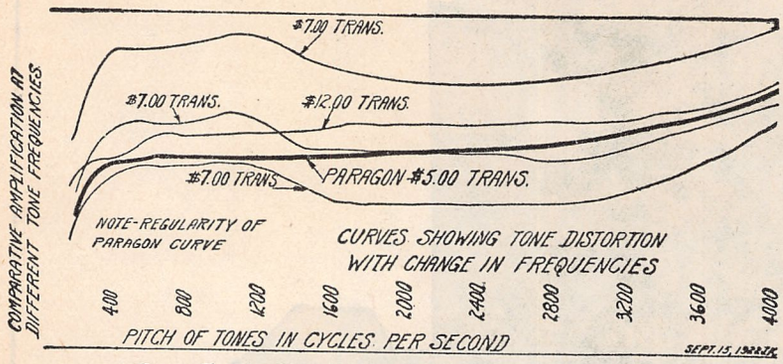
COLONIAL RADIO Ltd., Hamilton, Canada

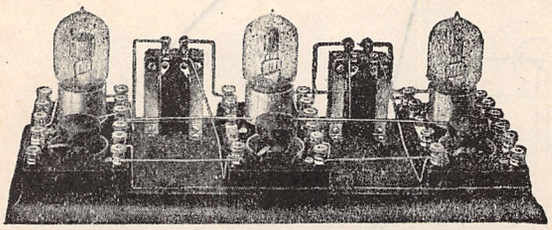
Distortion Kills Music

The Curves Show Why



Curves Showing Tone Distortion with Change in Frequencies

Unless the Amplifier Transformer favors *all tones in exactly the same manner*, distortion will result. Notwithstanding their high prices some of the transformers whose curves are shown above are totally unsuited to radio-phone reception. When you build use PARAGON, the same as is used in the Famous Paragon DA-2 Amplifier.



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while the forced oscillation builds up in value until its further growth is limited by the resistance of the secondary circuit. As a result the audibility will be limited in the same way. If it were now possible to introduce some means whereby the resistance of the secondary circuit could be gradually decreased there would result a corresponding increase in the oscillatory current, thus producing louder signals. This is in effect what occurs in the regenerative receiver.

To understand how this is accomplished, suppose we connect in series with the telephones of Fig. 10 a coil whose position may be altered with respect to the secondary coil, L, as in Fig. 11. This coil, called the tickler, produces the regenerative action. Suppose the position of this coil is such that it has no effect on the coil L, thus its axis may be perpendicular to the axis of coil L, or it may be at a considerable distance from coil L, so that in either case there is no transfer of energy from one coil to the other by induction. In this case conditions will be practically the same as for the circuit of Fig. 10—*i.e.*, the signal is definitely limited, for a given received voltage, by the circuit resistance.

Suppose now that the tickler coil, T, is changed in position so that it is either moved up closer and closer to coil L, or it is rotated so that its axis is more and more parallel to the axis of coil L. The coupling between the two coils is then increased, and due to this increased coupling there will be a transfer of energy between the two circuits. A voltage

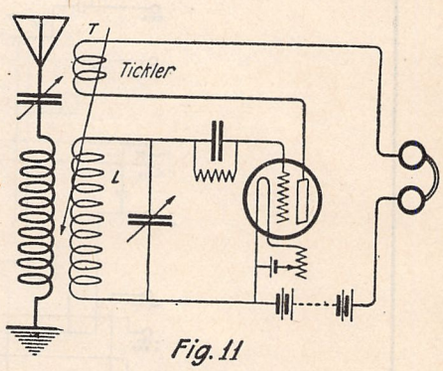
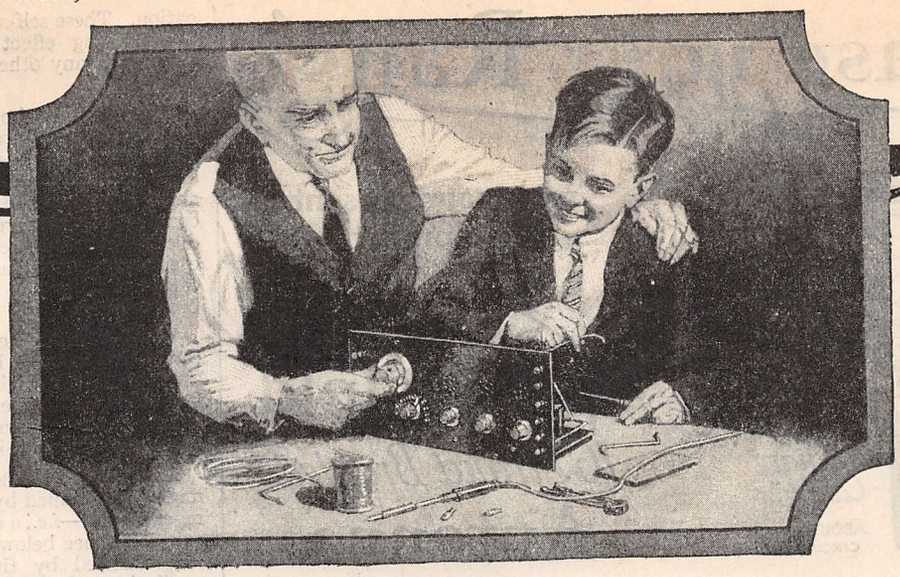


Fig. 11

Simple Regenerative Circuit.

will be induced in coil L by the tickler T, and as the coupling increases this induced voltage will also increase. This induced voltage will have the effect of overcoming or counteracting the opposing resistance reaction of the entire circuit, thus resulting in increasing the oscillation current over its original value. The more the tickler coupling is increased, the larger is the voltage induced in coil L, and the more is the circuit resistance counteracted, with the result that both current and signal become greater and greater. In other words, the effect of the regeneration is to decrease the resistance of oscillation circuit, thereby resulting in large increases in current and audibility of signal.

As the regeneration increases we see that in effect the resistance of the circuit is made to decrease. Hence, from the principles explained at the beginning of this article, it will take a longer time for the free oscillations to die out, for the smaller the resistance of the circuit the less the damping of the circuit. Now suppose that the coupling between the tickler and coil L is made so close that the voltage induced in coil L is sufficient to counteract entirely the circuit resistance. In this case the resistance of the circuit will in effect be reduced to zero. Since there is no resistance now to impede the flow of current, the free oscillations will continue to flow. However, when the resistance of the circuit drops to zero the circuit becomes unstable and any slight variation in filament current, or plate voltage, or in the circuit will result in the circuit generating self-sustained oscillations, which will destroy any amplifi-



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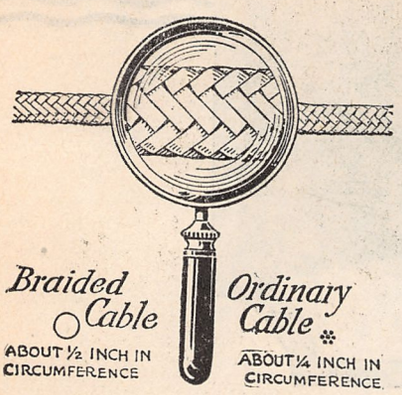

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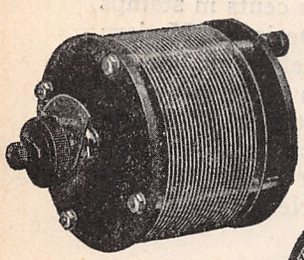

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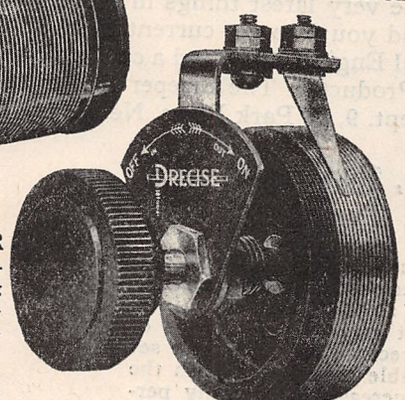

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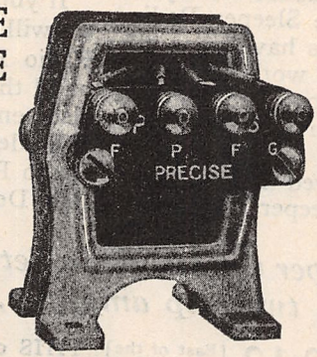

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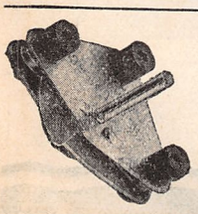

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cation. These self-sustained oscillations have a paralyzing effect on the tube, and will drown out any other oscillations which may be present.

This, then, is the limiting condition of regenerative amplification. So long as the tickler coupling does not result in completely annulling the circuit resistance, regenerative amplification can be obtained. As soon as the coupling becomes great enough to result in reducing the circuit resistance to zero, the free oscillations persist and destroy any amplification of the signal voltage which may have been secured.

What this regenerative amplification accomplishes is this: It reduces the circuit resistance from a high value to an extremely low value, but higher than zero, and thereby increases the current to very large values; hence also the audibility.

Apparently further amplification which might be obtained by a continued increase in regeneration—*i.e.*, a continued decrease in circuit resistanee below zero to negative values is prohibited by the introduction of self-oscillations. It is obvious that if this decrease in circuit resistance could be effected without the introduction of self-sustained oscillations amplification of unheard-of values would be obtained.

In this case we would have a circuit with a negative resistance. We saw how a positive resistance had the effect of limiting the value of a forced oscillation current, and damping out the free oscillation current. We also saw that when the resistance of a circuit was reduced to zero, the forced oscillation current was maintained at the value it had when the resistance became zero, while the free oscillation was not damped out, but continued to flow at the value it had when the resistance became zero. When a circuit has a negative resistance, not only is there no resistance to limit the value of the forced oscillation current or to damp the free oscillation, but an exactly opposite effect is had—namely, whatever free oscillation current there is in the circuit at the time the resistance has become negative, steadily increases in value and approaches infinity. In the case of the circuit having a positive resistance it was noted that it was the forced oscillation which was of dominant importance, most of the energy being in the forced oscillation. However, in the case where the resistance is negative and the free oscillation steadily increases in value, it is this free oscillation which is of major importance and the forced is of minor importance. Furthermore, this free oscillation has the property of starting with a value which is proportional to the applied voltage (in the case of a signal, it is proportional to the antenna voltage), and during any finite period of time the free oscillation maintains this proportionality. Hence it will be seen that, since the free oscillation in a negative resistance circuit may rise to enormous values, and since its value is proportional to the applied signaling voltage, it will repeat the transmitted signal with tremendous amplification, provided *the circuit does not break into self-oscillations which will destroy any amplification.*

As in regeneration, so in this case it is the self-oscillations, which are generated when the circuit resistance becomes unbalanced, that destroy the amplification which would otherwise be obtained. If some means could be devised to prohibit the generation of these paralyzing self-oscillations of the system, the tremendous amplifying effect of the free oscillations could be secured. This is precisely what is done in the Armstrong super-regenerative receiver.

Armstrong has discovered that if a regenerative circuit having a negative resistance is made positive at intervals, so that the circuit is alternately positive and negative, the circuit will not generate self-sustained oscillations, which will paralyze amplification. It takes a certain finite time for a negative resistance circuit to break into self-sustained

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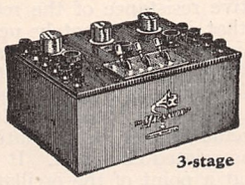

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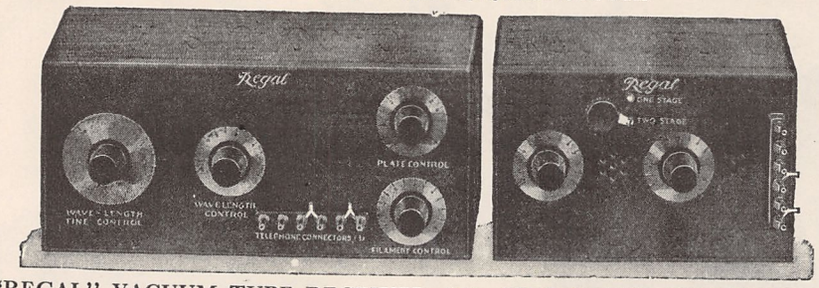

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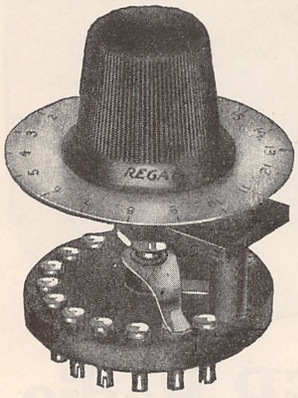

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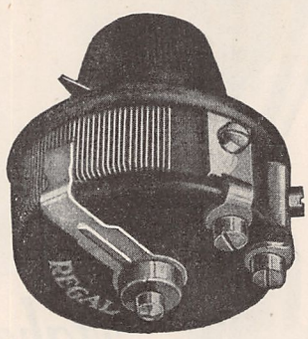

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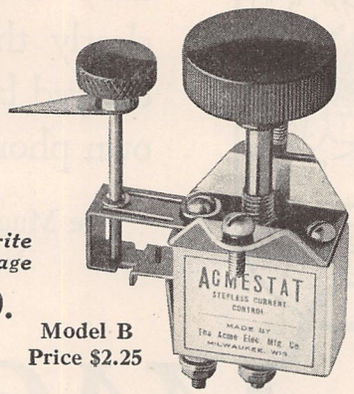

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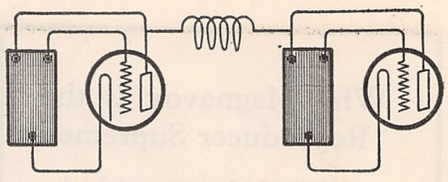

Fig. 12

Super-Regeneration May Be Accomplished by Variation of the Plate Voltage of the Amplifier.

oscillations. Up to the instant when the circuit is ready to generate these undesired oscillations, the circuit resistance is negative and hence the enormous amplifications possible with this circuit are secured. At the instant when the circuit is ready to oscillate on its own, it is made to have a positive resistance, thus inhibiting the tendency to oscillate, and the amplifications secured are, therefore, not destroyed.

There are three methods whereby the above effect can be secured. These will be described in principle. The first method secures the necessary change in resistance by means of a variation in the plate voltage of the regenerating tube. Fig. 12 indicates schematically the disposition of the circuits and tubes with respect to one another; R is the regenerating tube, O is an oscillating tube, I is the regenerative circuit associated with tube R, and II is also an oscillating circuit associated with tube O. The circuit I and tube R are adjusted for the regenerative condition. It will be observed that the plate of tube R is connected electrically to the oscillating circuit II. Hence the oscillating voltage due to circuit II is superimposed on the plate voltage of R. Now, when the plate voltage of R is increased, the regenerative effect is correspondingly enhanced, while when it is decreased, regeneration decreases; if it is sufficiently decreased, regeneration disappears. When the positive half of the oscillating voltage due to circuit II is applied to the plate of R, the plate voltage increases and super-regenerative effect is secured with enormous amplification, while, when the negative half is applied, the circuit does not regenerate, and hence the troublesome self-oscillations are not developed. The frequency of the oscillations in circuit II may be adjusted so that maximum amplification is secured, which frequency will be such that for the period of time which it takes for circuit I to break into self-generated oscillations, the positive half of the oscillating voltage due to circuit II is applied to the plate of tube R; and at the instant the tube is about to oscillate the negative half of the oscillating voltage due to circuit II is applied to the plate of tube R.

The second method of periodically changing the effective resistance of the receiving circuit, so that it is alternately negative and positive, is by varying the resistance of the grid circuit of the tuner circuit. This is shown in principle as follows: Fig. 13 shows again the regenerating tube R with its associated circuit I, and the oscillating tube O with its associated circuit II. It will be observed that a point of the oscillating circuit II is connected to the grid of circuit of tube R. During the negative half of the oscillating voltage wave from tube O, a negative voltage is applied to the grid of tube R; hence there are no losses in the grid circuit, and if the tickler in circuit I is very closely coupled, super-regeneration is secured with high amplification. On the positive half of the voltage wave from tube O, the grid of R is positively

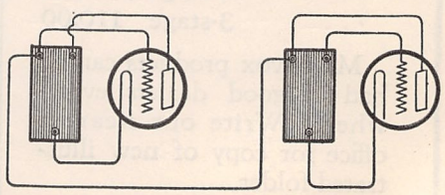

Fig. 13

Another Method of Super-Regeneration Consists in Varying the Resistance of the Grid Circuit.

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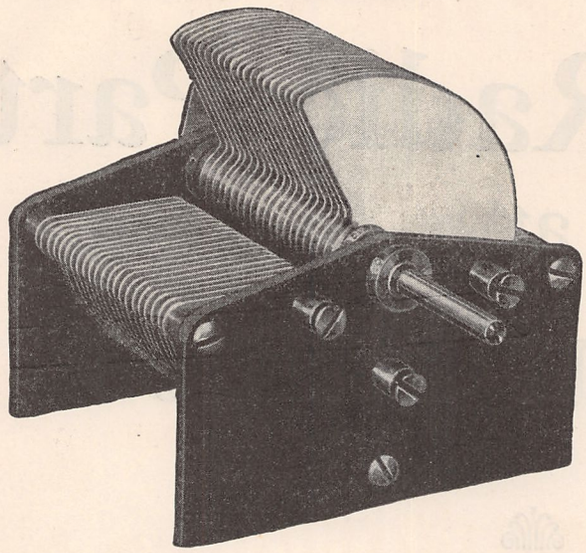

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charged, high losses take place in the grid circuit of R, which means a high positive resistance in circuit II, and hence any tendency of circuit I to generate self-oscillations is destroyed.

The third method of securing the requisite alternate change of circuit resistance from positive to negative is a combination of both of the above methods.

The exact value of the frequency at which the circuit resistance varies from positive to negative—namely, the frequency of oscillations generated in circuit II, is a matter which depends upon what is being received. Thus, for radio telephone signals or signals which are modulated at the transmitter it is necessary that the frequency be above audibility so as not to interfere with the incoming modulated signals. For C. W. signals, which have not been interrupted at the transmitter end an audible frequency may be used.

The Radio King

(*Continued from page* 1069)

an iron hook from the third-story window As he looked, undecided what to do, his enemy, Renally, the mysteriously cloaked man and a foreign-looking woman dashed out of the door. As Jimmy's clothes tear and he starts to fall, the two attack Lane. But he is equal to the emergency. When Jimmy comes hurtling down he falls into the upstretched arms of his patron, and Renally staggers away from Lane's pile-driven blows.

"Tell me what happened," gasped Lane as Jimmy tried to patch up his coat going up the stairs. In eager, half-finished sentences, Jimmy recounted how Renally had broken into the Leyden apartment with the cloaked man and a woman, had overcome him and a nurse after he had sent the message that Lane received on the radio set fitted into his hat.

How the second mystery man had appeared and how Renally had thrown him through the window just as he was about to grasp the revolver that was always in old John Leyden's desk.

"Renally must have seen you as he tried to hit me from the window sill. Then they all fled down the stairs. Here's Miss Ruth now."

"Thank God you're safe," breathed Bradley as he took the weak and badly shaken girl in his arms.

In another part of the city, on the water front, Doria Valerian was reporting her own failure to Marnee and urging him to perfect his Master Wave, that terrible engine of science whereby the anarchists hoped to conquer and control the entire civilized world. Gradually the customary confidence of the twisted countenance of Marnee returned. By good luck more than good planning both he and Renally had escaped. Their luck might hold until they could put over the greatest stroke the world had ever seen, the absolute suspension of all electrical energy by means of a "master wave," which was the supreme conception of this diabolical genius. But the master wave had not been perfected and with such facilities as the waterfront offered there was little chance to perfect it. But Doria pointed out that both Lane and Leyden had excellent laboratories and Lane had driven Marnee out of both his. Why not take one of these?

Bradley Lane was making his will. Fully realizing that he had but a short time to live, he wished to make provision for the two persons he loved best in all the world. His meter had told him that his collapse might come at any time. So intent was he on the serious work in hand that his usually keen premonitive sense was not working. Over his shoulder another pair of eyes were reading and this is what they read:

What will you do during *the* Long Winter Evenings?

A Crosley Radio Receiving Set will solve this problem ~

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Write for fully descriptive catalogue and discount sheet

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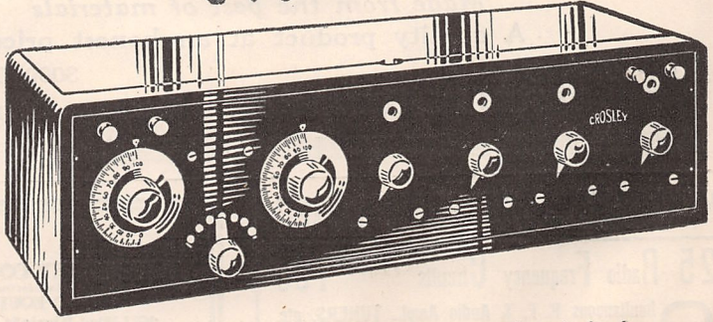

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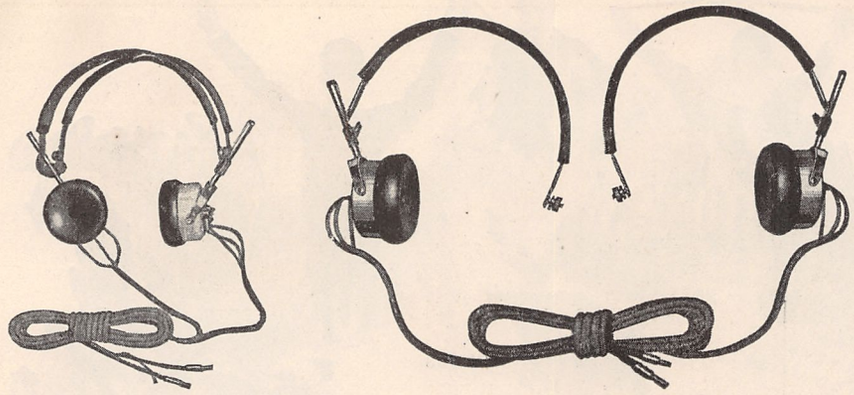

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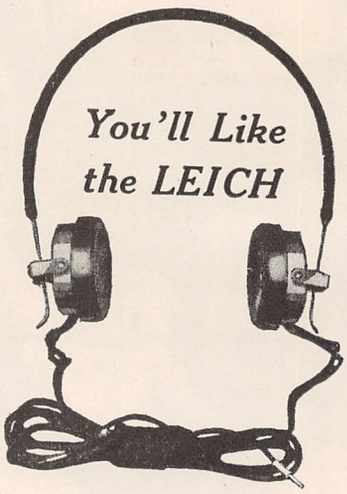

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A quality product at an honest price
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Manufacturers
RADIO EQUIPMENT
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"I, Bradley Lane, knowing that my time in this world is drawing to a close as the result of an electrolization by Marnee, do hereby bequeath all my property real and personal to Ruth Leyden, my executors to enjoin upon her my request that she rear and educate one Jimmy Lawton, an orphan, whom I love as dearly as though he were my own son. . . ."

"Forgive me, Bradley, for reading it,——"

The interruption was from the radio.

Lane jumped up to tune in.

"It may be another ruse of Marnee's," cautioned Ruth. But Bradley Lane had no fear. However, he did take the precaution to use his visualizer, an invention by which he could see who was talking before even hearing the voice. It was headquarters and the chief wanted Lane. But before he could turn away from the instrument the room suddenly became alive with men. Caught, utterly unarmed and unprepared, Lane felt the unmistakable muzzle of a gun in the small of his back.

"I've come to use this laboratory, since you have taken mine," snarled Marnee. It was Renally, however, who held the gun. "Here in the workshop of my victim, Leyden, I shall perfect my master wave. And when I do, my revenge on the world—on you, shall be complete. I will stop industries, transportation, ships—I will nullify radio communication and all electrical energy. Airplanes shall drop from the sky like rain—nothing is impossible to me—Marnee."

The deformed anarchist struck an attitude that expressed both heroic accomplishment and grotesque buffoonery. Then his expression of exaltation changed to one of hate and malice as he saw Jimmy and Ruth.

"Look," he commanded, "for the last time upon the boy whose mother jilted the deformed Marnee."

And to Ruth——

"Look for the last time upon the man you love. And look now upon Marnee, whose servant you shall be and whose bidding you shall do."

Beside himself with rage and fury, Lane broke from the grasp of Renally and grasped Marnee about the throat. In one jump Renally had brought down his revolver butt on Lane's head. He sank senseless to the floor.

CHAPTER IX

"THE HAND OF VENGEANCE"

Bradley Lane's failure to appear in answer to the urgent headquarters' radio message was sufficient reason to send a detail to the Leyden home where he had picked up the official communication.

Had they any suspicion of the real danger which threatened the master sleuth, they would have violated all traffic laws to reach the Leyden laboratory.

Barely conscious, Bradley Lane lay helpless on the floor of the laboratory from the blow of Renally's pistol. Marnee was undisputed master of the situation.

With an imperative gesture to the Man-in-the-Cloak, Marnee spoke: "Take him away and if you are faithful to Ivan Kronski never let me look upon his face again."

But Ruth, facing the terrible threat which Marnee had just made to her, was thrown into a paroxysm of anxiety by this threat, which was even more terrifying to her.

"Stop!" she cried, as she leaped to the side of her helpless fiance. "I will give you anything, ask what you will,—as the price of his life!"

Marnee was on the point of refusing. With his arch-enemy in his power, what had she to stay his hand? He had everything to gain and nothing to lose. But Renally, uninfluenced by personal feeling in the matter, realized that only Ruth knew the re-calling secret imbedded in the Leyden cylinder already in their possession. He whispered to Marnee. Reluctantly the deformed demon signed to his followers to put Lane down.

AUTOMATIC ELECTRIC LONG RANGE RADIO HEAD SETS

AUTOMATIC ELECTRIC LONG RANGE RADIO HEAD SETS

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With Plug attached
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have overcome two faults characteristic of the conventional two-pole, two-coil type of receiver

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The danger of the diaphragm vibrating in sections and the added loss and distortion, due to the fact that the alternating magnetism set up in the coils of ordinary receivers has to pass through the permanent magnet or across a large air gap, are eliminated.

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The practice of Chiropractic consists of the adjustment, with the hands, of the movable segments of the spinal column to normal position for the purpose of releasing the prisoned impulse

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A chiropractor is not a "Jack-of-all-Trades." He is master of one.

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He doesn't know much, but what he does know is true What he **does** know works so well that Chiropractic has been built upon the failures of those who know so much that isn't true.

It takes three years of constant application in a first-class resident school to train a chiropractor to properly adjust the spine, **providing** he has the ability to learn. All the schools in the world, however, cannot train a person who lacks in faculty or desire to learn. Such incompetents invariably attempt to hide their lack of ability behind a mass of adjuncts, such as electrical devices, dietetics, baths, etc.

The competent Chiropractor uses nothing but his hands, and does nothing but adjust the misaligned vertebræ.

If you are thinking of trying Chiropractic, select a competent Chiropractor.

Employ none but a **competent** chiropractor.

Write for information regarding Chiropractors or Schools to the

Universal Chiropractors' Association, Davenport, Iowa, U.S.A.

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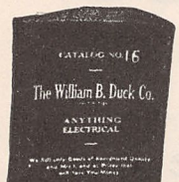
DUCK'S RADIO CATALOG No. 16—256 PAGES



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Note—If knob and dial are not desired, deduct 75c.

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In absolute silence, but with a meaning look at Ruth he slipped the cylinder which had balked his every effort to make it talk, on the roller of the dictograph. Again he turned the switch.

"Not that way," exclaimed Ruth, "reverse the roller and it will give its message."

With an annoyed look, Marnee turned off the switch, reversed the roller, and turned it on again.

With varying emotions, the occupants of the room awaited the result. Even Lane was coming back to consciousness of what was going on. The Mystery Man, who was dressed so like the Man-in-the-Cloak, showed every sign of desperation, and, had Marnee and Renally not been so absorbed in what they were doing, they would have paid more attention to this remarkable spy.

Suddenly, the whir of the needle gave place to words:—

"I, John Leyden, discoverer of the secret of recalling lost messages, do hereby make record of it, said record to be delivered to the President of the United States . . ."

So close was the anarchists' concentration that they didn't notice the Mystery Man cautiously possessing himself of a wrench from the table back of him. The cylinder continued:—

"My secret of recalling lost messages is done by . . ."

A quick movement from the Mystery Man, and the traitorous cylinder flew into a thousand pieces from the wrench he had hurled at it.

In a fury, all of the anarchists hurled themselves at the Mystery Man. Lane, neglected for a moment, reached his hand through a panel and made a sign to Jimmy Lawton, who threw a concealed switch in the outer room. Instantly blinding flashes of light from hidden places in the laboratory darted about the room. In terror, the anarchists crouched from these unsuspected laboratory defences.

Into this tense situation, headquarters' detectives entered. With this re-inforcement Lane himself threw off the switch.

The anxiety for Lane's safety enabled most of the Reds to escape down the hall, and among those who escaped were Marnee, Renally, the Mystery Man and Doria Valerian.

"Don't mind me, get Marnee," said Lane, reeling unsteadily. He was too late. They had made good their escape at the expense of the foremost detectives who tried to intercept them.

All efforts of headquarters to locate the new refuge of the anarchists availed them nothing. Until Lane recovered from his most recent experience, which weakened his electrolized constitution still further, they virtually had given up hope of discovering Marnee's whereabouts.

But their radio told them unerringly that the scientist was continuing his experiments in some un-locatable laboratory. As a matter of fact, Marnee had established a workroom in a cabin just outside the city, but in a locality in which no one would ever look for him.

His wonderful genius had supplied in a very short time the instruments which he needed to develop his master wave.

But Marnee had one enemy even more implacable than Lane. It was the man who had three times balked him through his resemblance to the Man-in-the-Cloak. At the very moment when Marnee was chuckling over his two-fold success in hiding and all but perfected master wave, this individual was stealthily looking into the window of the cabin. As he did so, he heard Marnee exclaim to Renally, "I have done it. Another day and my master wave will be able to nullify all electrical energy. You will see."

As he said so, he switched on the current and both anarchists laughed in glee as the tremendous flashes of light responded to the instruments. But this experimenting had also

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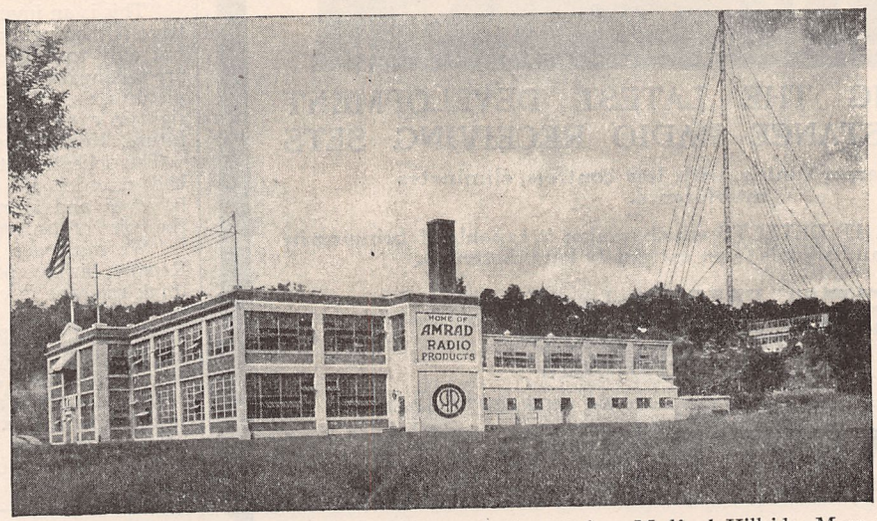

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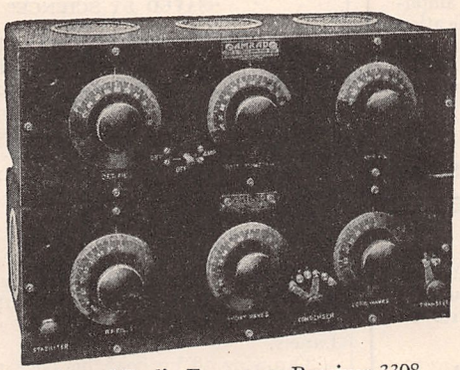

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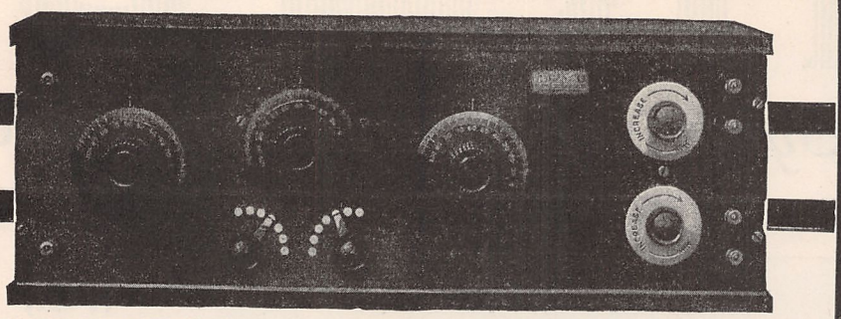

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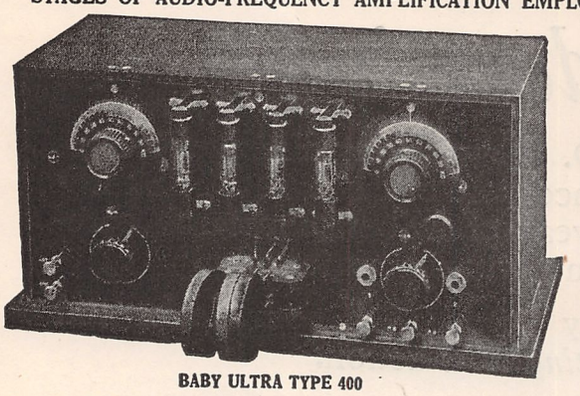

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Decreases static and strays.

Small and Compact 15½″ x 7½″ x 7½″ deep.

Operates at full efficiency on wave-lengths from 150 to 25,000 meters by simply inserting proper sets of coils.

The Baby Ultra amplifies the signals again and again at RADIO-FREQUENCY before rectifying, bringing in signals which would otherwise be inaudible and then amplifies at Audio-Frequency.

It employes a circuit which makes short wave reception and RADIO frequency amplification possible and avoids the necessity of adjusting each successive stage of amplification with each change of wave-length received.

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Amateurs we rewind and repair fones; send them to us.

its danger and Marnee knew it. He switched them off quickly. Its temporary effect on radio activity, however, was noticeable in every set in the United States.

In Lane's apartment a headquarters' man was explaining this growing menace at the very moment of Marnee's latest experiment.

"Unless we find this man immediately he will have every electrical instrument in the world at his mercy," exclaimed the detective.

"It's Marnee," growled Lane, "it's possible that I will be able to locate him with this finder." So saying, he picked up an odd, complicated device and adjusted it to the tuning-in instrument.

After a few manipulations of the visualizer, Lane gave an exclamation of satisfaction: "There he is! I see him perfectly."

"But what kind of an instrument is that?" said the detective.

"This is an invention of my own. When I have it thoroughly perfected, we will be able not only to see our friends with whom we are talking, but we will be able to see moving pictures, as well as to see concerts by radio, right in our own homes. But that is in the future. Now we are concerned with Marnee."

The delicate instrument in Marnee's cabin had recorded the action of the visualizer, however, and Marnee knew that he was on the point of discovery.

"We must act immediately," he said to Renally, his face perturbed with anxiety. "I think someone is very near us now. Go out and see."

As Renally walked down the path, Lane was controlling, by radio, a strange-looking automobile. The door of the garage rolled back, and without any driver a smart-looking automobile, with a strange aerial apparatus, turned the corner and *drove itself* down the street to Lane's home and stopped in front of his door.

A hundred yards from the cabin, the second Mystery Man jumped on Renally from the rear. The sound of the struggle attracted Marnee, and he dashed out of the improvised laboratory to be of what assistance he could. He found the senseless form of Renally and his absence gave the Mystery Man an opportunity to get into the cabin.

In the meantime, the real Man-in-the-Cloak was following the radio-controlled car from the city, and in order to intercept him, Lane jumped on an overhanging branch of a tree in a part of the road which was extremely rough and rutty, and permitted Ruth and Jimmy to continue to the cabin.

As the Man-in-the-Cloak slowed down for the rough road, Lane dropped on him from above. A short struggle and he had assumed the strange disguise of his antagonist and was hurrying in pursuit of his own car.

As he turned the corner, he beheld a horrifying sight—the car with Ruth and Jimmy in the front seat was just disappearing over a cliff.

Chapter X.

"SAVED BY SCIENCE"

For once it seemed that Marnee and Renally were to be victorious. It appeared impossible that any human aid could reach Ruth Leyden and Jimmy Lawton, as the car containing the pair, bound and helpless, tore down the slope of the steep hill, at the bottom of which great jagged rocks and sinister boulders loomed up menacingly.

But Lane did not despair. Ruth and Jimmy were in the radio equipped and controlled touring-car that the Man-in-the-Cloak had seen approach the Leyden garage without a driver; being guided automatically by radio through an invention of Bradley Lane's.

Throwing off his coat, his back might have been seen to be equipped with a flexible steel plate extending from the top to the bottom of his waistcoat. This was fastened to his body by steel-mounted straps that disappeared beneath his clothing through little slits cut in it. With this plate were connected switches

"Rasco Has It"

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THE Radio Specialty Company, "RASCO" for short, is probably the most unique radio parts supply house in the United States, if not in the world today. This Company makes a specialty of **SMALL ORDERS.** No order can be too small to get immediate and prompt attention, for the simple reason that **most of our orders are small.**

The reputation of this Company was built solely on service. Ask any of your acquaintances what they think of "RASCO" goods, "RASCO" service, "RASCO" promptness! Thousands of unsolicited testimonials on file prove that we serve the public best!

Many houses claim that their orders are shipped within twenty-four hours. A year's record in our Order Department actually shows that over 99% of our orders leave within **twelve hours** after receipt. We invite you to try "RASCO" service on a 50c order. **MAKE US PROVE WHAT WE SAY.**

Sixty-eight per cent of all of our customers come back for more goods after they have tried our service once. The reason is very simple, as we specialize in very small orders. We could not stay in business if we had to look for new customers continually.

"RASCO" SERVICE IS WHAT COUNTS!

"Rasco" Catalog No. 8

The new "RASCO" catalog, No. 8, will prove a revelation to the man who "builds his own." In this catalog are listed more parts and more items than you have previously thought possible to obtain.

The new "RASCO" catalog contains over 500 different radio items, and has been greatly enlarged over the preceding one. **IT NOW CONTAINS 64 PAGES, INSTEAD OF 40.**

Price Reductions

Many items have been reduced to give our customers the benefit of the lower prices that enlarged production makes possible.

Factories in Brooklyn, N. Y., and Elkridge, Md.

These two factories, where our screw machine work, our stamping and our composition work is turned out, make it possible for us to offer the very lowest prices in the country.

75 Vacuum Tube Hook-Ups!

These hook-ups of **ALL** important vacuum tube connections are given in clear diagrams with complete explanations. This is the one and only catalog containing such a wealth of information on all Vacuum Tube sets, giving all the correct values of all the elements, so that any amateur can readily hook up a set with the instructions furnished.

All Armstrong Circuits: These important circuits are explained clearly, all values having been given, leaving out nothing that could puzzle you.

Just to name a few of the Vacuum Tube circuits: The V.T. as a detector and one-step amplifier; regenerative circuit; DeForest ultraudion; V.T. to receive undamped and spark signals; Armstrong circuits; one-step radio frequency amplifier and detector; three stage audio-frequency amplifier; short wave regenerative circuits; V.T. radio telephone; 4-stage radio frequency amplifiers; radio and audio frequency amplifier, inductively coupled amplifier; Armstrong superautodyne; radio frequency amplifier and crystal detector; combination V.T. detector one stage amplifier; two stage radio frequency amplifier and detector with feedback coupling (regenerative); regenerative receiver, using single spider web coil; Armstrong super-regenerative circuit; two stage radio frequency amplifier coupled to a two-circuit tuner, using two-slide tuner regenerative receiver; two stage audio-frequency amplifier, using crystal or V.T.; one stage radio frequency detector, two stages audio-frequency with feed-back coupling to first tube; power amplifier with loud speaker; regenerative receiver and one stage amplifier for DX work; one stage radio frequency detector with feed-back coupling; very sensitive circuit with two stages of radio frequency and regenerative detector; one to ten mile radiophone transmitter; three stages radio frequency, two stages audio-frequency loop reception; crystal detector with rectification; one tube super-regenerative receiver; short wave regenerative receiver with two variocouplers, capacity-coupled tuner; trap circuit to eliminate interference; selective circuit to eliminate interference.

In addition to all of this important information, we have added a section of important radio information, giving various tables, etc., for the benefit of the amateur.

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TRADE MARK **BKUMA YRLSBUG** REG. AP. FOR

ATTENTIVE BEGINNERS WHO USE

DODGE ONE DOLLAR RADIO SHORT CUT

DO MASTER CODE
IN MINUTES INSTEAD OF WEEKS
DO QUALIFY FOR EXAM
IN HOURS INSTEAD OF MONTHS
DO SUCCEED
AFTER TOTAL FAILURE WITH OTHER METHODS

9 CCW Reports memorized Code in TWENTY MINUTES.
2 BXY Qualified by 3 hours' practice—15 minute periods.
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USUALLY PAYS TO INVESTIGATE B4 UBI.

For One Dime will mail Honor Roll of Beginners in 12 Radio Districts who QUICKLY made themselves Licensed Operators.

For *Every Dime* of Cost Our Method *Saves Dollars.*
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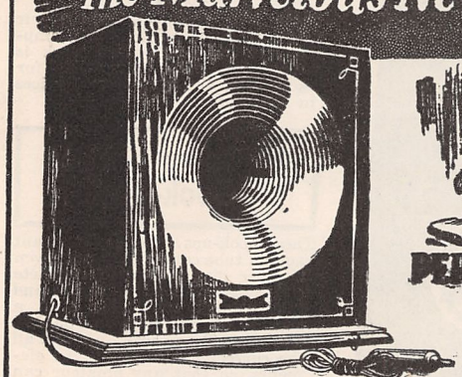
C. K. DODGE Box 200 MAMARONECK, N. Y.

The Marvelous New PLANET Loud Speaker



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PLANET POWER AMPLIFIER

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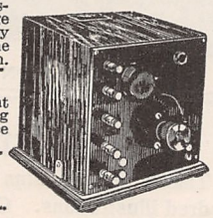

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HIGHLY SENSITIVE—LOUD TONES ONLY.
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What better or more appropriate Christmas Gift—than your favorite magazines? A constant reminder of the giver.

Send us your list today. We will enclose **Christmas Cards** in your name upon request.

EXPERIMENTER PUBLISHING CO., Inc.
53 Park Place, New York

and terminals that ran to his feet and around his shoulders—although most of these were also concealed by his attire.

Instantly, he "threw" the switches!

The car, tearing along at its mad pace, was headed directly for an enormous boulder. But, just as destruction appeared unavoidable, just as Marnee and Renally were about to vent their evil triumph in loud jeers at Lane's helplessness, an almost incredible thing occurred.

The car stopped. It was as though a giant's irresistible hand had reached out and caught the car from behind. Then, it began to move—backward! Bradley Lane, for the first time in the history of the world, had shown that it was possible to overcome the laws of gravity without the aid of either engines or dynamos!

Neither Marnee nor Renally could take their eyes from the car as it moved steadily back up-hill. When, finally, it reached the spot where Bradley Lane stood, their eyes turned to him in wonder and amazement. Then they flung themselves upon him. But Lane was ready for them. Swinging on his heel, he delivered a terrific "pivot-blow," directly under Marnee's jaw-bone, dropping him like a tree under the final crash of the woodsman's axe. His second blow, a short-arm jab with his left, caught Renally in the solar-plexus and sent him staggering backward.

But, just as he imagined he had temporarily put his enemies to rout, Comrade "X," the Man-in-the-Cloak, who had disappeared from sight a moment or so before, now leaped upon Lane just as he turned again to free Ruth and Jimmy. Renally, recovering slightly from the blow he had received, reached for his automatic and levelled it at Lane.

But Lane, too, had an ally in hiding. That person who had duplicated Comrade "X's" appearance, so far as attire went, and who had hurried to the scene of conflict after setting fire to the laboratory in the hut, sprang on Renally, also from behind, bringing down his pistol-arm.

But, for all that the altruistic impostor who wore the cloak and the soft broad-brimmed hat was the weaker man, he fought with a rage and a fury that made up for his deficiencies. Renally staggered back before the furious onslaught of the avenging arm. Back to the very edge of the cliff, relentlessly, the false Man-in-the-Cloak drove him on. Clutching wildly at the empty air, as the imitation Man-in-the-Cloak suddenly let loose his hold, Renally lost his balance altogether and plunged headforemost down to the sharp and jagged rocks below. It was the end.

Meanwhile Lane was struggling with the real Man-in-the-Cloak. Not until he had well nigh choked the life out of him was he able to unfasten the cloak which had disguised him so long.

Unspeakable amazement sat on the faces of Ruth and Bradley Lane.

It was the Leydens' butler.

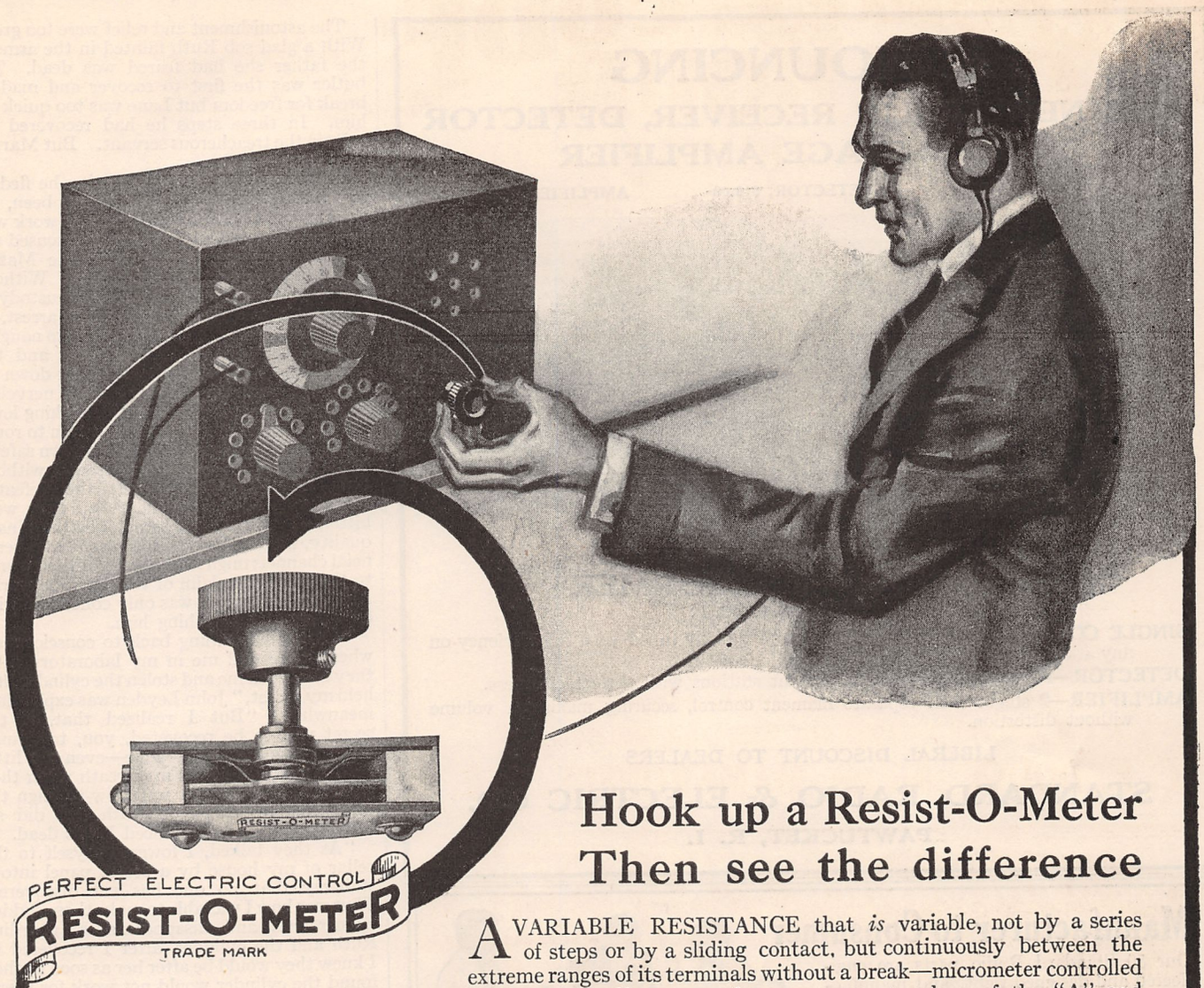
Instantly many things which had been mysterious, became clear to them. No wonder their plans had been known to Marnee before they could be executed. No wonder the attack on the old scientist had been so easy and successful. But the thought of Ruth's father galvanized Lane's astonishment into activity. Shaking the treacherous butler like a bundle of rags Lane sternly demanded:

"Where is John Leyden?"

"John Leyden is dead," replied the shaken butler with dignity of a losing cause fast crumbling before his certain fate. "We did away with him because he was a menace to Ivan Kranski's plan to rule the world."

So intent were they all that no one had noticed the pseudo Man-in-the-Cloak who had just wreaked vengeance, full and complete, upon Renally and who now stood before them.

"John Leyden is not dead," said the cloaked figure. And with the words he undid the high collar of his cloak as a victorious crusader of old might have lifted his visor. "I am John Leyden."



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TRADE MARK

The Resist-O-Meter illusirated is Type A-Filament, **Price $1.80**

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Type A-Filament
" B-"B"Battery
" C-Potentiometer
" D-Variable Grid Leak

Test-Rite Condensers in following capacities:

Phone .001 mfd.
Grid .00025 "
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Hook up a Resist-O-Meter Then see the difference

A VARIABLE RESISTANCE that *is* variable, not by a series of steps or by a sliding contact, but continuously between the extreme ranges of its terminals without a break—micrometer controlled for accurate adjustment of proper current values of the "A" and "B" batteries.

This ideal has been developed—The Scholes Resist-O-Meter.

This Scholes Resist-O-Meter possesses the following additional and essential advantages:

1. It is non-microphonic.
2. It possesses the lowest resistance at full compression. (almost zero).
3. It is made of models giving various ranges of control previously not attained (covering every requirement for radio use.)
4. It is made in compact and conventional form, requiring minimum room for mounting.

The Scholes "Resist-O-Meter," in principle, has been used for more than seven years in electro-chemical processes in which exceedingly accurate and constant current control is required.

This apparatus, simple in the extreme, has been refined and perfected to adapt it to the minute currents and sensitiveness of control needed for radio work.

The Scholes Radio and Manufacturing Corporation holds the sole license to manufacture this type of radio rheostat. It is sold only under the name "Resist-O-Meter" and fully protected by patent and trade mark rights. Your dealer will supply it. Ask for the Scholes Resist-O-Meter.

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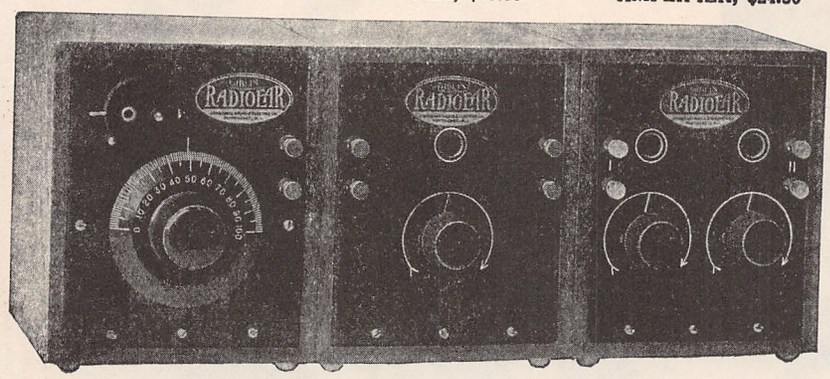
THE NEW GIBLIN RECEIVER, DETECTOR AND 2-STAGE AMPLIFIER

TUNER, $15.50 **DETECTOR, $10.00** **AMPLIFIER, $24.50**



$50 COMPLETE

A GENUINE PERFORMER

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SINGLE CONTROL TUNER—It is easily and quickly tuned with full efficiency on any wave-length.

DETECTOR—Receives either local or distant stations with perfect clearness.

AMPLIFIER—2 stages with separate filament control, securing maximum volume without distortion.

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Our 50 Standard Radio parts are engineered and designed right, and manufactured under minimum overhead. Our factory is now under full production and can supply your needs.

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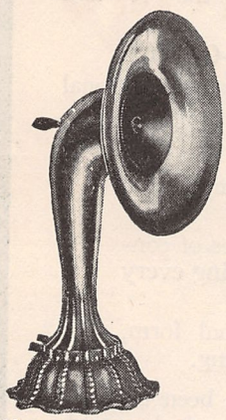
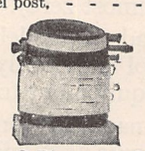


Micr-O-Phone Reproducer with modifying sounding board. Designed by experienced engineers. Will reproduce music and speech in any volume or sound desired, with purity of tone as clear as original. Heavy cast polished aluminum. Equipped with army and navy loud speaking receiver and 6 feet of cord. By parcel post, complete - - - **$20.00**

Micr-O-Phone Listener-In for Crystal or Tube sets. A one-head phone connected to this instrument and the whole family can listen in. Saves the cost of additional head phones. Made of heavy cast polished aluminum. Equipped for 6 persons. By parcel post, - - - - - - - - complete **$5.00**



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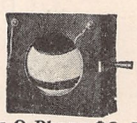

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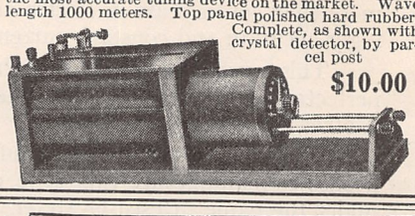

Cardboard Paper TUBES FOR WIRELESS

⅛ inch Wall

2½, 3, 3¼, 3½, 3¾ in. O. D. Per foot		30c
4, 4¼, 4½, 4⅝ in. O. D.	"	35c
5 and 5½ in. Outside Diameter	"	40c
6 in. Outside Diameter	"	50c

Postage Extra, Shipping Wt. 1 lb. per foot
Dealers, write for special price list

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Richer in Silver, harder denser, makes better contact than Galena detectors found elsewhere. New Style Mounting (pat. applied for) as superior to present method as soldered connection is to unsoldered in electric wiring. Mounted, 50c.; Unmounted, 25c. Special terms to dealers.

WONDER STATE CRYSTAL CO.
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The astonishment and relief were too great. With a glad sob Ruth fainted in the arms of the father she had feared was dead. The butler was the first to recover and made a break for freedom but Lane was too quick for him. In three steps he had recovered his grip on the treacherous servant. But Marnee had disappeared.

With the aid of Doria Valerian he fled to the hut, or rather to where it had been, for the hand of vengeance had done its work well and the humble building that had housed the greatest invention of Marnee, The Master Wave, was smouldering in ruins. Without money and with the band either in custody or in hiding, and in momentary fear of arrest, he knew his present plans had all come to naught. In utter despair the twisted soul and the twisted body both failed. He sank down on what had been the doorstep and his nerveless hand aimlessly picked up a still smoking lever handle. Doria Valerian tried in vain to rouse him. Then she too thought of her own safety. With a shrug of her shoulders and without even looking back she left the defeated inventor to his reflections. And they were bitter. For here was a brain of extraordinary quality, which, if turned into useful and beneficial channels might have brought their owner to the highest acclaim of the scientific world. And now that world was only concerned with capturing and punishing him.

"I was just coming back to consciousness when you found me in my laboratory after they had felled me and stolen the cylinder that held my secret," John Leyden was explaining, meanwhile. "But I realized that, if the secret was to be recovered, you, too, must think I was dead—everyone—even my little Ruth here. So I held my breath when they examined me; I knew well how to feign the other manifestations of death and did so. So you, too, were convinced I was dead.

"As they talked, I lowered myself to the cellar of my house by a secret panel into a stairway that no one has yet discovered. That was how I was able to make those sudden appearances and disappearances, guarding Ruth and the cylinder, after I recovered it. I knew they would be after her as soon as they found the cylinder would not work for them, so I was forever on guard, but now I think it is safe for me to come to life again."

But there was one more necessity for John Leyden's ever unfolding genius. Lane's physical condition was such that the doctors had absolutely given him up and Lane would not marry Ruth under such circumstances. Leyden was equal to this supreme test. When all medical science had failed he discovered still another secret of electricity by which he was able to nullify the electrolization to which Marnee had subjected Bradley Lane. And in saving his life he not only confirmed Ruth's profound belief in Providence but removed much of the danger that had attended the handling of huge currents of electricity.

The rest is like the histories of all peaceful countries and no country was ever more happy than the life history of Bradley and Ruth. They were married as soon as Bradley was strong enough, and both Jimmy Lawton and Fatty Evarts were at the wedding. Once, a little later, Lane thought he saw Marnee; the figure, bent and limping, cringing and furtive, had a look of such familiarity that Lane was tempted to stop the car, but then it might have been a tramp shuffling along in the greasy conglomeration of rags and patches. Anyway Kranski had been killed trying to evade arrest and the pathetic figure evoked no alarm, only compassion. He didn't even mention the matter to the most contented looking of all women—Mrs. Bradley Lane.

THE END.

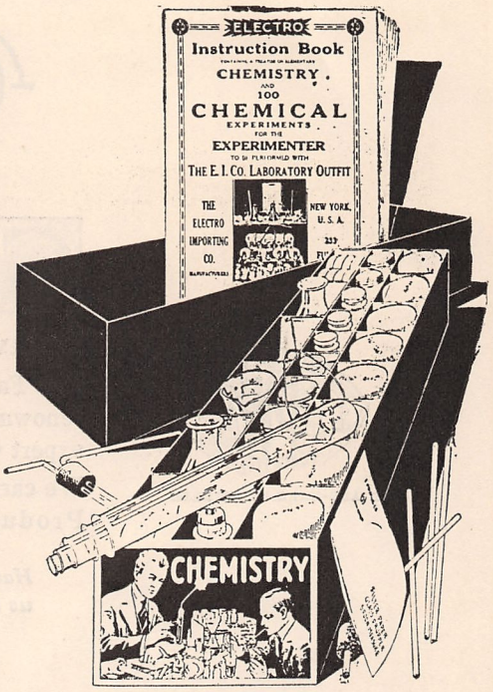
HEARD THE OTHER NIGHT

Announcer: "I m Going To Marry You," by request.

A Chemistry Laboratory for $7.00

Think of it, fellows! Here is a **real** chemistry outfit with regular chemical apparatus that performs those fascinating, actual chemical experiments.

This outfit is not a toy, put up merely to amuse, but a practical laboratory set, with all the chemicals, apparata and reagents necessary to perform real work and to teach the beginner all the secrets of inorganic chemistry. With this outfit we give free a book containing a Treatise in Elementary Chemistry, useful data and recipes, and 100 instructive amusing experiments.



DESCRIPTION OF THE OUTFIT

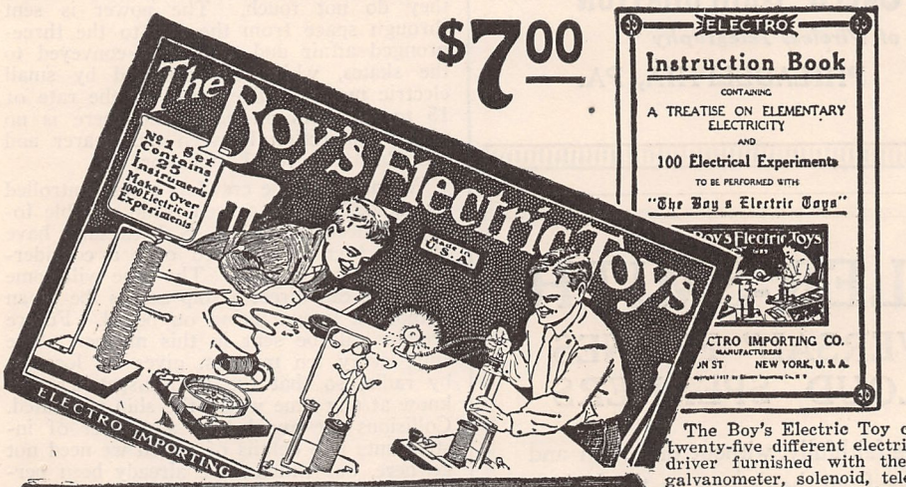
The outfit consists of forty-four (44) chemicals all C. P. (chemical pure) put up in appropriate wooden boxes, glass bottles and hermetically closed jars. The acids are put up in glass bottles, with ground-in glass stoppers, and there is a sufficient quantity of chemicals supplied (mostly one to two ounces) enough to make dozens of experiments with each.

The apparata furnished are all of the best obtainable make and of standard laboratory size and shape. 17 pieces of apparata furnished with this outfit.

The instruction book is a real Chemistry Course for the Beginner. Some of the Contents are: Division of Matter: This is a Treatise on Elementary Chemistry, and deals with the theory of the Elements, Molecules and Atoms, etc.

100 EXPERIMENTS

How to make chemical tricks; how to make invisible and magic inks; how to test flour; how to test soil; how to make chlorine gas and smoke (German War Gas); how to bleach cloth and flowers; how to produce oxygen and hydrogen; how to make chemical colors; how to test acids and alkalies, and hundreds of interesting hints and formulas.



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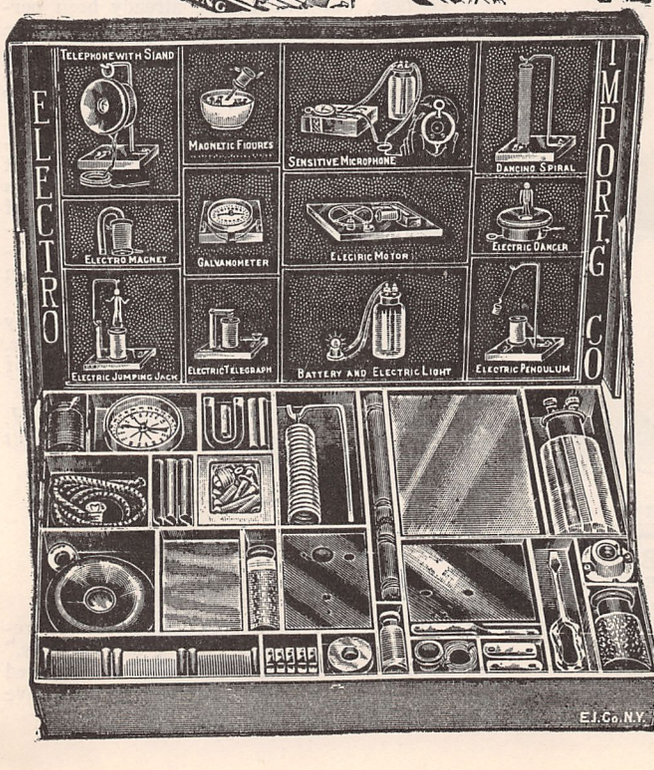

Every Fellow Wants the

BOY'S ELECTRIC TOYS

The Boy's Electric Toy contains: Enough material to make and complete over twenty-five different electrical apparatus without any other tools except a screwdriver furnished with the outfit. Student's chromic plunge battery, compass-galvanometer, solenoid, telephone receiver, electric lamp. Enough various parts, wire, etc., are furnished to make the following apparatus:

Electromagnet, electric cannon, magnetic pictures, dancing spiral, electric hammer, galvanometer, voltmeter, hook for telephone receiver, condenser, sensitive microphone, short distance wireless telephone, test storage battery, shocking coil, complete telegraph set, electric riveting machine, electric buzzer, dancing fishes, singing telephones, mysterious dancing man, electric jumping jack, magnetic geometric figures, rheostat erratic pendulum, electric butterfly, thermo electric motor, visual telegraph, etc., etc.,

This does not by any means exhaust the list, but a great many more apparatus can be built actually and effectually.

With the instruction book we furnish one hundred experiments that can be made with this outfit, nearly all of these being illustrated with superb illustrations. No other materials, goods or supplies are necessary to perform any of the one hundred experiments or to make any of the 25 apparatus. Everything can be constructed and accomplished by the means of this outfit, two hands and a screwdriver.

The outfit contains 114 separate pieces of material and 24 pieces of finished articles ready to use at once.

We guarantee satisfaction.

The size over all the outfit is 14 x 9 x 2¾. Shipping weight, 8 pounds. "The Boy's Electric Toys" outfit as described, $7.00. Immediate shipment.

SEND FOR YOUR SET TODAY

REMEMBER

JUST CLIP THE COUPON—DON'T SEND MONEY

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ELECTRO IMPORTING CO.,
233 Fulton St., New York.

Please send me by express THE CHEMICAL LABORATORY. If I don't like it I need not accept it. If I want it I only pay $7.00 plus the few cents express charge.

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ELECTRO IMPORTING CO.,
233 Fulton St., New York.

Please send me by express THE BOY'S ELECTRIC TOYS. If I don't like it I need not accept it. If I want it I only pay $7.00 plus the few cents express charge.

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We manufacture 3" pure Bakelite Dials at very attractive prices. Immediate delivery.
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Buy now while deliveries can be made
2 VARIOMETERS 1 VARIOCOUPLER **12.50** WITH THREE 3 INCH MOULDED DIALS
Everything in Radio - Dealers Write
EHRLER-RADIO
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The Future of Radio

(*Continued from page* 1066)

His business correspondence comes in entirely by radio. There is a teleradio-typewriter. This electro-magnetic typewriter can be actuated by any one who chooses to do so. For instance, if we wish to write a letter to Jones & Company, Chicago, Ill., we call up by radio, that station, and tell the operator that we wish to write a letter to the company. Once the connection is established, the letter is written in New York, let us say, on a typewriter, and automatically sent out through space by radio; letter for letter, word for word being written by the other typewriter in Chicago. The letter when finished falls into a basket. Instead of sending our correspondence by mail we shall then do our letter-writing by radio. There is nothing difficult about this scheme, and as a matter of fact, it can be put into use today, if so desired. We have all the instrumentalities ready.

Going further, we find the Radio Power Distributing Station that sends out power over a radius of 100 miles or more. This radio power may be used for lighting, and other purposes.

In front of the bridge we see a number of people who are propelled by Radio Power Roller Skates. On their heads we see curious three-prong metallic affairs. These collect the radio power from a nearby railing which, however, is not in view, and which they do not touch. The power is sent through space from the rail to the three-pronged affair and then it is conveyed to the skates, which are operated by small electric motors. These roll at the rate of 15 to 20 miles an hour, and there is no visible connection between the wearer and the Radio Power Distributor.

We next see the crewless ships controlled by radio. This has been made possible today. Indeed, several U. S. battleships have already been maneuvered over a considerable distance by radio. The time will come when we can direct a ship across the ocean without a human being on board. Future freight will be sent in this manner. The ship, every ten minutes, gives its location by radio, so that the land dispatcher will know at any time where the ship is located. Collisions are avoided by a number of instruments into details of which we need not go here, but which have already been perfected. Collisions with icebergs also are avoided by thermo-couples which divert the ship away from the iceberg as soon as it enters water which has been cooled below a certain degree.

The radio-controlled airplane works similarly to the radio-controlled ship, and it will be possible to control such airships very readily in the future. As a matter of fact, John Hays Hammond, Jr., in this country, has done this very thing. Radio-controlled airplanes will play a great rôle in the next war.

It is a mistake to think that radio is only good for the distribution of intelligence. As the illustration shows, the great uses of radio have not been touched upon as yet.

From the Book, "Radio for All," by H. Gernsback. Courtesy of J. B. Lippincott Co., Publishers, Philadelphia, Pa.

THEY WERE RIGHT

By A. J. de Long

Some fans have been criticized for referring to atmospherics by the term "statics," which is slang, yet it is not to be compared with the pet names that some amateurs have used in this connection.

Radiation From the Receiving Set

(*Continued from page* 1079)

a license," because actually you are TRANSMITTING SIGNALS on a wave of approximately 15,000 meters, which may travel for miles.

The use of a separate heterodyne may be the only solution to this problem, but even then the signals may travel quite some distance if the heterodyne is not properly screened.

Recently the National Physical Laboratory in England conducted a series of tests on screening the local heterodyne. Their report follows:—

"The problem of screening a piece of apparatus from the effects of a high-frequency electromagnetic field is known to be much more difficult than screening it from steady electric or magnetic fields. Electrostatic screening may be accomplished by surrounding the apparatus with a metal covering which need not be completely continuous—such, for example, as metal gauze—and magnetic screening from a steady field can be accomplished by surrounding the apparatus by a heavy iron screen. Experiments with high-frequency fields, however, give the impression that the difficulty of such screening is much greater, but this is largely a false idea due to the fact that the induced EMF in any circuit placed in an alternating magnetic field is directly proportional to the frequency, and, therefore, becomes very large at the frequencies used in radio work. It is essentially this fact, coupled with the high amplifications possible with multistage valve receivers, that lead to unexpected results when endeavoring to shield instruments from radio frequency fields."

The experiments that were carried out arose from the need for developing a local heterodyne oscillation generator for use in connection with directional reception. The heterodyne oscillator can be operated entirely from a 6-volt battery* and the problem is to screen the receiving apparatus from the effects induced directly by the oscillator, which would tend to distort the directional readings obtained with the receiver. The transfer of electrical energy from one oscillating circuit to another may take place either by mutual induction or by radiation, or by both of these methods. In the case under consideration—viz.: that of a heterodyne oscillator near to a receiving apparatus—the transfer is almost entirely by mutual induction, and the problem may therefore be considered correctly as the limiting of the high-frequency magnetic field around the oscillator by induced eddy currents in the screening body.

The first experiments made in this direction were carried out with an "R" valve, operating from a 6-volt battery, and having a wavelength adjustable between 1,000 and 10,000 meters. With this instrument used in conjunction with a large frame aerial and a 7-stage amplifier, signals from the more powerful C.W. stations could be perceived even when the local oscillator was quite 100′ away from the amplifier. This indicated how very small is the oscillating current required to give a beat-note with the incoming signals. When the oscillator and its battery were placed inside a thin copper box, with a loose-fitting copper lid, the induced oscillations in the receiving coil were considerably reduced in strength and were only effective in producing beats when the oscillator was within 20′ of the coil aerial. The use of a galvanized iron box gave similar results. In both these cases it was noticed that the placing in position of the lid of the screening box had a considerable effect on the reduction

*See Sept., 1921, Radio News, page 201, "Throw That B Battery Away."

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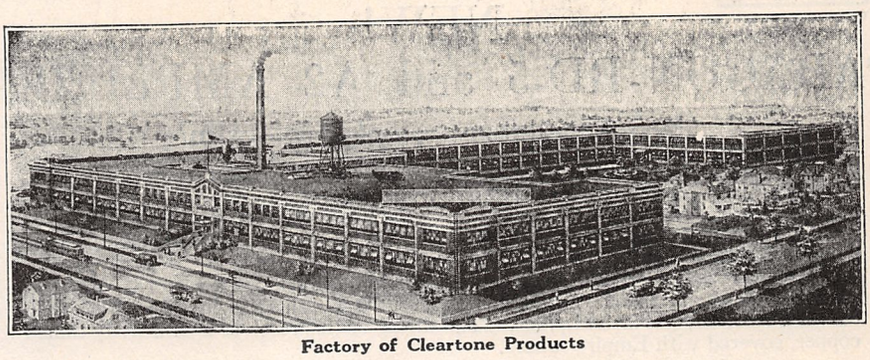

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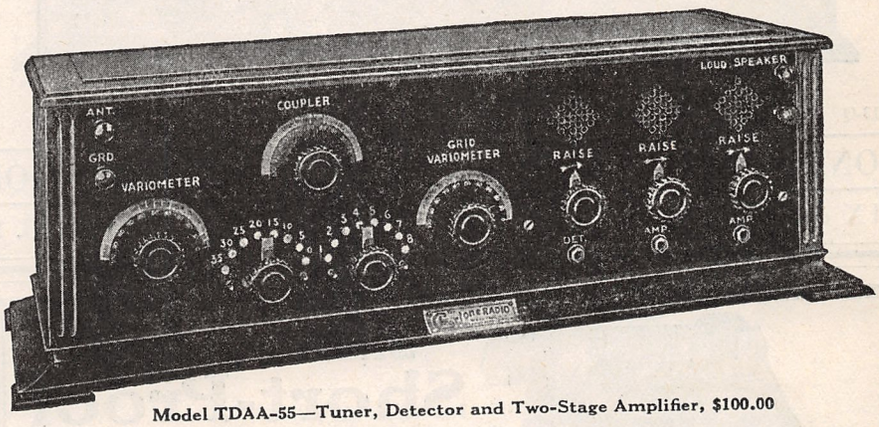

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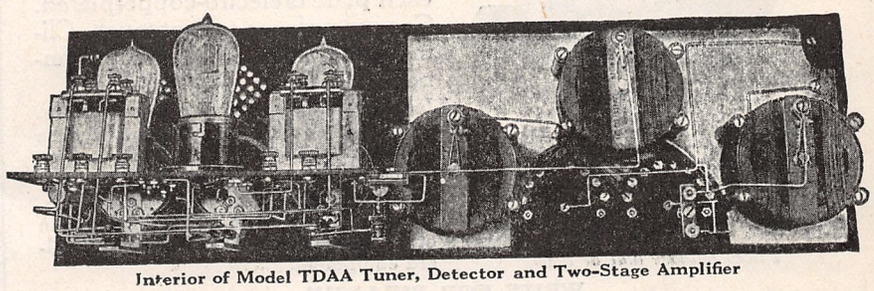

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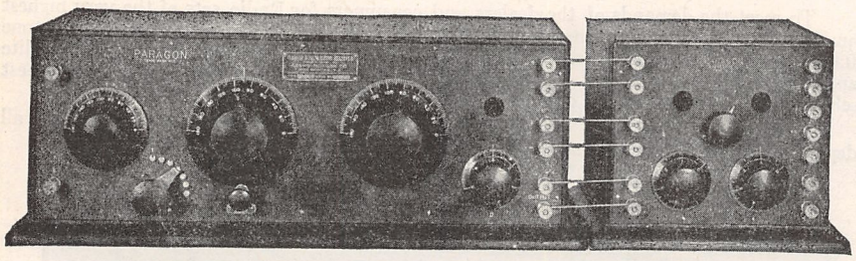

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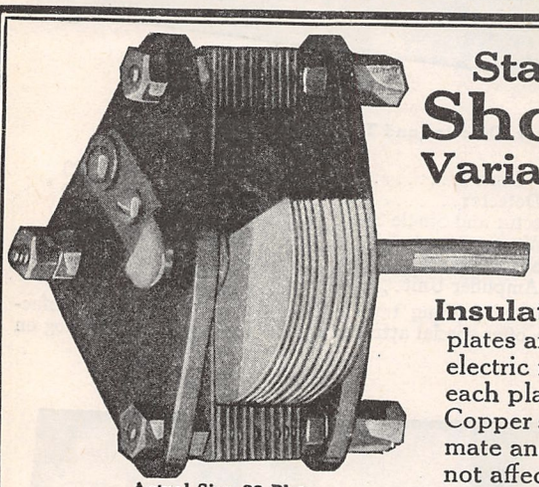

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of the induced field, but that the position of the open end of the box relative to the receiving frame aerial appeared to be immaterial to the strength of the induced currents.

The oscillator and its battery were next placed inside the copper box as above, and this was in turn supported on blocks of paraffin wax inside an iron box, the respective lids of the boxes being in position. In this condition the beat-note was only noticeable when the boxes were placed within about 12′ of the frame aerial. By the use of a small search coil attached to the amplifier, it was proved that a considerable proportion of the escaping energy came out through the space between the lid and the sides of the box, the lid having an overlap of about ½″ only. By fitting another lid having an overlap of 3″ all around, the effectiveness of the screening was further increased. Experiments were also made with screening consisting of two metallic boxes of various sizes, one being inside the other, and with various arrangements of lids, giving results similar to those obtained as above described.

Tests were also conducted on the effect of bringing connecting leads outside the screening boxes in order to provide a means of definitely coupling the heterodyne to the receiver itself, but as usually experienced in such cases, it was found that as soon as any part of the wire was exposed outside the metal screening, powerful beat-note signals were heard in the receiving amplifier.

As a result of the tests, a design for a screened oscillator was prepared, using a wooden box, double lined with sheet copper one sixty-fourth inch thick, fitted with an inner copper lid, and with a second enveloping lid constructed of wood and double lined with sheet copper. Ebonite connecting pins were used between the control handles on top of the lid and the corresponding condenser knobs, switches, etc., within the box. The metal parts of the control handles were in metallic contact with the outer coating of copper. A separate coil within the box was used to couple to the inductance of the oscillator circuit, and leads from this coil were led out of the box through metallic sheathed wires to a double D-shaped coil, to which was coupled a second pair of D-shaped coils, the terminals of which form the outer terminals of the instrument.

The following are the chief features of the instrument:—

1. The entire control of the oscillator is obtained from outside, and it need never be opened except for inspection or for recharging the accumulator, the complete oscillator with its batteries, etc., being within the sheathing.

2. The opening of the box is a simple operation and does not necessitate the breaking of soldered joints, etc., although when in normal working condition close metallic contact is secured at all joints.

3. No part of the oscillator circuit itself is outside the inner metallic casing, and the external coupling is made through a static coupling arrangement (the double D coils).

4. Variations of the coupling of the D-shaped coils form a convenient means of varying the effective strength of the heterodyne.

When using this oscillator in conjunction with a rotatable frame aerial and amplifier for direction finding work, it was found that it caused no errors in the observed bearings, thus proving the effectiveness of the screening, provided the oscillator was kept outside the frame itself. If mounted at the center of the frame, it caused variable errors to a maximum of two degrees.

Soldering up the joints of a simple copper box surrounding the oscillator was found to reduce considerably the energy radiated from the box, but some still passed apparently through the metal itself, but a similar experiment made with a tinned iron box proved that the iron was much more opaque to the radiation than the copper, as soldering up all the cracks cut off the radiation completely. The theory of the penetration of high-frequency currents into metal indicates

that such a difference is to be expected and that, in fact, iron should be equivalent to between four and six times the thickness of copper. Hence, it is only possible to screen a valve oscillator completely (as far as an ordinary high-frequency amplifier is concerned) by enclosing it in a hermetically sealed box of tinned iron of sufficient thickness to prevent the direct penetration of the high-frequency magnetic field through it. A mercury seal for the lid of the tinned iron box proved equally effective to the solder, but the slightest crack not closed allowed a relatively large escape of radiation. For complete screening in this manner no controls can be carried outside the box, unless with careful design it should prove possible to seal with mercury these moving parts as well. If controls cannot be carried outside the screening, a large part of the value of the heterodyne is lost, especially since the frequency of the oscillator is changed by a considerable amount when the lid is put on the box, owing to its effect upon the inductance of the coil in the oscillation circuit.

The efficiency of these screening methods depends upon the frequency of the oscillations, and decreases with increase of wave-lengths, the longer wave-lengths proving more difficult to screen. Since, however, the amplifier and its associated circuits are much less affected by the stray fields of longer wave-length, the difference is not so serious as the mathematical theory would at first lead one to expect. The difficulty of screening amplifiers, etc., from disturbing low-frequency fields, however, rather tends to emphasize this fact, and to confirm the general results given by the theory.

The difficulties of high-frequency screening arise mainly, therefore, from the extreme sensitiveness of modern amplifiers, as compared with galvanometers and instruments of a similar class for which magnetic screening (low-frequency) is more usually called for. Given the same sensitivity of detecting instrument, however, the theory indicates that to obtain the same effectiveness for the screening, the metal would need to be about 80 times thicker for a 100-cycle magnetic field than for an oscillation with a 300-meter wave-length.

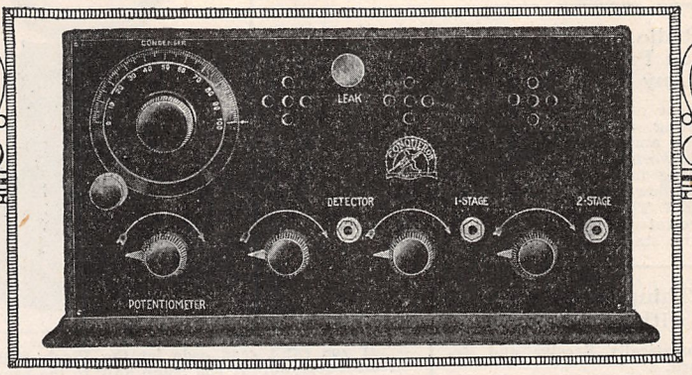
To effectively screen a low-frequency amplifier or note magnifier from disturbances would, therefore, seem to require much more massive screening than is ordinarily employed for this purpose.

All this seems to be getting far away from our subject of radiation, but if it is accepted that to prevent radiation of a receiving set by the use of a heterodyne, we must take some care in screening the heterodyne itself so it will radiate when we do not want it to.

A simple heterodyne coupled to an aerial will radiate just the same as an oscillating detector, but if we screen it sufficiently the energy radiated from the aerial will be so near zero that we may then consider that we have a station "*equipped to receive only.*"

The writer has at different times listened in on about 75 radiophone concerts with a non-oscillating audion receiver. In every case, except three, some station near by would be listening in at nearly the same wave-length *with his bulb oscillating*, producing a beat-note by the combination of the radiophone carrier wave and the oscillating detector mentioned. In at least 50 of these cases the beat-note was so strong that the concert was completely spoiled, while in others it was weak enough to let a little music through. Among the stations whose concerts were completely spoiled were Newark, Detroit *News*, Amrad, on 360 meters; Paris on 2,600 meters, and Writtle, England, on 400 meters. Also in several cases the slight difference in wave-length of two radiophone concert stations when both were sending at the same time produced a strong beat-note in the receiver, but this cannot be helped while all the concerts are broadcasted on practically the same wave-length.

CONQUEROR



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INQUIRIES FROM JOBBERS SOLICITED

Monarch Telephone Manufacturing Co.
Fort Dodge, Iowa

Weather Forecasting by Radio

(*Continued from page* 1079)

the same effect on stations in their direction as Southern storms have on Southern stations. Schenectady, Buffalo and Detroit will be very faint and wavy with bursts of static and clicking, but the lightning clicks come at greater intervals, while the static bursts are not as strong or as lasting as with southern storms. Lightning from the West is not, as a rule, so vivid or severe as Southern lightning.

Generally speaking, a bolt of lightning striking the earth, or, in fact, any streak or chain lightning, produces a sharp click in the receivers, while sheet lightning, which flashes vividly without showing a streak, produces a roar or burst of many small clicks.

Frosts may be expected on "freak" nights in the fall or early spring. Heavy frosts usually occur just before or after continued rain; thus, they may be expected on the nights when stations in the far West or Southwest come in unusually clear, forecasting the fact that the area of low pressure (or if after a storm, high pressure) is approaching. Farmers, as a rule, expect a frost after a fall rain, so a "freak" night coming in advance of a storm will be the best forecast of a likely frost.

Snow storms will produce effects closely following continued rain, but will not be accompanied by the severe clicking or crackling static, as electric discharges are practically absent. Stations in the area of the approaching storm will be indistinct and wavy if audible at all, while a slight scraping sound like that caused by a poor "A" battery connection will denote the unsettled atmospheric conditions.

Extreme cold waves will be forecast by the exceptionally distinct and loud reception of Western stations. This reception will continue until perhaps two days before the wave breaks. Wavy reception with scraping static will foretell the end of the cold wave and the approach of warmer weather generally from the South or Southwest.

A short study of the weather maps will enable one to become familiar with the courses followed by storms or atmospheric disturbances, also the prevailing winds and winds caused by local geographical conditions. After learning this, it is simply necessary to note the different forms of static and the general direction from which they come, to form a fairly accurate idea as to what sort of weather to expect.

After noting the qualities of your reception each night for a week or so and then checking it up with the weather for the corresponding time, you will be able to discover the reasons for what would otherwise seem to be radio undependability. Another good method is to study your reception carefully during the early part of the evening and then when WJZ or the nearest station broadcasting weather forecasts sends out its nightly prophecy check up your notes with their forecast and shortly you will be able to forecast accurately for yourself.

Correspondence From Readers

(*Continued from page* 1094)

transmitter since before the war. For the last two years I have been doing research work on receiving circuits, etc. This amateur can be heard on a short-wave set consisting of coupler and variometers and cannot be tuned out, and has his strongest wave apparently between 360 and 600 meters.

Of course, there is no doubt that a properly tuned outfit can open up full power and not cause interference at a distance of several miles. However, any transmitter, no matter how well tuned, will be plainly audible within a mile or two.

I am a strong supporter of amateur radio, but agree with Mr. Perry as to the present situation, and the attitude of some of the old-timers seems to indicate that a sort of fossil shell has grown over their formerly joyous personalities. Adversity shows up the true merit of any one or any organization and many are being weighed in the balance and found wanting.

If you will be so kind as to publish this, I will appreciate it, and if Mr. Humes cares for corroboration, will he kindly write to Mr. Tingley, City Manager of the A. R. R. L., in Des Moines.

I have often felt that in RADIO NEWS the popular articles were displacing the true amateur article and there is a slight justification for that. It now seems to lack a middle class appeal, that is, the articles are too technical for the amateur in many cases, and in others too much of a popular nature. This, however, I feel will take care of itself and offer it merely as a suggestion to you.

One last word. I wish one of these fellows getting such results with crystals would tell me where he gets the crystals. I have been unable to get any really good ones. I have some ideas that have shown foundation in tests made with proper measuring instruments, but the class of crystal that I have obtained has been entirely unsatisfactory in use.

In closing I wish to congratulate you on your "Correspondence from Readers" pages.

JOHN W. MILLION, JR.,
Des Moines, Ia.

ABOUT HONEYCOMB COILS

Editor, RADIO NEWS:

I never fail to read the "Correspondence from Readers" section and find it very helpful.

I was especially interested in Mr. D'Ascenzo's article on H. C. Coils in the September issue of RADIO NEWS and I was glad to hear someone stand by honeycomb coils.

He certainly is right when he says that a good many operators will warn one away from honeycombs, but the majority of those who say this are stating hearsay alone, having had no experience with these coils whatever.

Besides the fact that these coils are not bulky and can be back-mounted as well as variometers and variocouplers, their adaptability to both short and long waves should make them more popular than they are at present.

I had better stop before variometer fiends start shooting guns at me.

I will add, however, that with one detector tube and with homemade mountings, my coils have given very satisfactory results.

Let's hear another "broadcast" concerning honeycombs.

JULIAN T. BENTLEY,
Edgewood Farm, Big Foot Prairie, Ill.

FROM A RADIOPHONE FAN

Editor, RADIO NEWS:

On page 453 of the September issue of RADIO NEWS I read a letter from Ray Hardenbergh, of Minneapolis, in which he made some rather caustic slurs on the class of fan known as a "novice," the fan who has a set merely to get the broadcasting.

It is quite natural that, being a constant reader of RADIO NEWS, and happy to belong to that class which Ray Hardenbergh holds in such disdain, I should take exception to what he has to say

C-H RADIO Rheostats are built in two styles for detector and amplifier tube control. Type 11601-H1 with vernier adjustment is recommended for detector control because of the critical characteristics of the tubes used for this purpose. Type 11601-H2 is furnished without vernier. Both rheostats have a range of four ohms with one ampere current capacity.

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THE CUTLER-HAMMER MFG. CO.
Milwaukee, Wisconsin

C-H RADIO RHEOSTATS
"BUILT BY RHEOSTAT BUILDERS"

Pioneer Variometers and Variocouplers are "Just Beautiful"

No other make approaches them, in design, workmanship, or finish.

Shells are molded in our own factory, from genuine Bakelite not turned from a block of wood.

Winding of both stationary and revolving members, is with the finest green silk-covered wire.

And here is something wholly new!—The **Pioneer Variocoupler is wound on the INSIDE of the shell,** just like a variometer!

All metal parts are solid brass, nickel plated and burnished.

And they are as good as they look.

For the perfect balance of the roters, the positive contacts, and the workmanlike balanced accuracy of every detail give finely-shaded results that delight every user.

Wave lengths 150 to 550 meters.

Table or panel mounting.

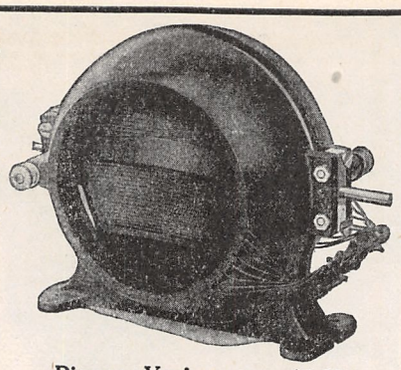
Prices no higher than others charge for inferior instruments.

Order through your dealer. Accept no substitutes.

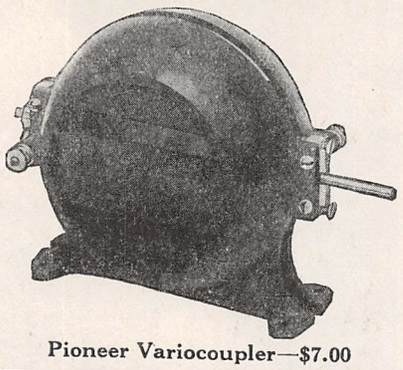
Circular on request.

PIONEER RADIOPHONE CORPORATION

GALESBURG, ILL., U. S. A.



Pioneer Variometer—$6.50



Pioneer Variocoupler—$7.00

The New "All Wave" Coupler

TRADE MARK

(FLAT AND BACK WOUND)

Eliminates the use of all Variometers, Variocouplers and Loading Coils, inasmuch as it performs in one compact unit the functions of all of these devices combined.

For the Novice—The six efficient hook-ups given free with each "All Wave" Coupler enables the greenest novice to attain the same results attained by the expert in building the simplest, most compact and most efficient radio receiving set possible.

Guaranteed Wave Length—150 to 3,000 metres, with the most selective tuning imaginable for long and short wave and long distance reception.

Unusual Results Attained—Individual users of the "All Wave" Coupler have written us that in New Jersey they have listened in as far west as the University of Wisconsin and Chicago, whereas in Montreal, Canada, it is nothing unusual to bring in Schenectady, Detroit, Chicago, Pittsburgh, Newark and the Arlington time signals, direct.

Beware of Imitations—of the "All Wave" Coupler, which is guaranteed with a money back to operate as advertised. Look for the trademark, "All Wave" on the rotor.

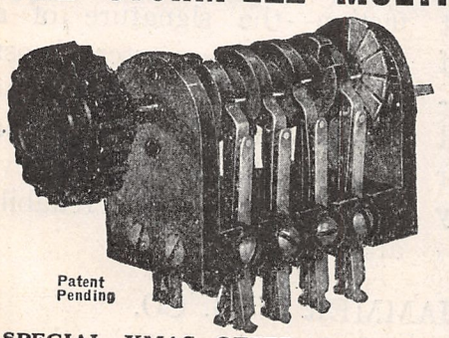
Patents Pending

$9.00 Six efficient Hook-ups sent upon receipt of 10c stamps or *Free* with each *"All Wave"* Coupler

Capitol Phonolier Corporation

54-60 Lafayette Street, New York City

THE STORM-LEE MULTIPLEX ROTARY SWITCH



Patent Pending

The Perfect Amplifier Switch, Gives Complete Control of Detector and 1, 2 or 3 Stage Amplifier, Including Automatic filament control.

The **MULTIPLEX ROTARY SWITCH** takes the place of filament control jacks in the vacuum tube control panel, giving much greater convenience at lower cost. With this switch you may change from detector to any desired stage of amplification by merely turning one knob. Filaments of unused stages being automatically extinguished.

FREE—with each switch, a diagram showing **HOW TO RECEIVE WITHOUT AN AERIAL, LOOP, OR SOCKET PLUG.** No radio frequency needed. Signals and 'DX' compare favorably with outside antenna. Requires no apparatus not used in a regular regenerative 2 stage amplifier set. Remarkable tuning and selectivity.

This circuit may be used with any standard regenerative set without change in wiring — The diagram only—**25c.**

SPECIAL XMAS OFFER PRICE with directions... $4.00

Write for Descriptive Folder.

BEWARE! of imitations of our Switch. We are the originators of this type universal cam switch, protected by Patents Pending.

STORM-LEE RADIO APPARATUS CO.

742 HIGHLAND AVENUE NEWARK, N. J.

To begin with, I wonder if Mr. Hardenbergh realizes the fact that where there is one amateur who is filling the air with a lot of annoying spark nonsense, merely aimless chatter for the sake of staying up late, there are probably 20 or 30 who are trying to listen in to some concert or educational feature as it is being broadcasted from their district station. While Mr. Hardenbergh is wasting his time pounding his key, there are plenty of *novices* who are learning something, from the talks or classical programs from WJZ, KDKA, WGY, WAAL, etc.

I am operating a detector and two-step, with which I have had remarkable results. This is the third set that I have had. The first two were crystal sets. I am sure that while I am not as wise as Mr. Hardenbergh I am learning something, due to a great deal of experimenting, and perhaps I could show Mr. Hardenbergh a trick or two.

If all the amateurs are as intolerant and bigoted as he, I am glad that I am not classed as an amateur.

I will grant that there are some *amateurs* who are doing some very important relay work, but the great majority of them are only interested in seeing how much they can clutter up the air, with, "I saw Marj. today," and this type of conversation, to the discomfort of perhaps 100 or 200 in his immediate neighborhood. I am able to read the code faster than any amateur I have ever heard pound the brass, and that is the average type of "message" upon which these *amateurs* waste their time and generators.

I again take exception to Mr. Hardenbergh's statement that in a year or so the broadcasting craze will have passed. The identical same thing was said of wireless telegraphy, the telephone, the phonograph, and a dozen more inventions that were classed as fads when the public first took hold of them. Please look further than your nose, Mr. Hardenbergh.

You are going in the right direction when you cater to readers of my class just as much as when you cater to the amateur. Broadcasting has come to stay, and I will warrant that I am right in this assertion.

Fortunately, I have no amateur next door to me who can drown out WJZ, KDKA, WGY, WRL, WGR, or other stations that I have heard. Therefore, I am not writing this letter to take out my spite on some amateur who is a nuisance, but merely because I have listened to a few of them with the exclusive C. W. sets and have heard others complain of the interference, and because I do not think it fair to those who are really the ones who patronize your advertisers and your publication, instead of making a lot of makeshift instruments ourselves, for Mr. Hardenbergh to be so bitter and narrow-minded in his attack on the poor ignorant novices, and the conduct of your worthy monthly which I am sure has helped me to a fuller appreciation of the possibilities of the radio telephone and a keener enjoyment of its educational and entertaining features.

EDWARD C. SPENGEMAN,
Maplewood, N. J.

ON CAPACITY COUPLED TUNER

Editor, RADIO NEWS:

In my enthusiasm for the "Super-Selective Receiver" described by Samuel Kopelson in a recent issue of RADIO NEWS, I am writing this. I had what I believed to be an ideal variometer set. I imagined it tuned sharply and thought the signals were loud and clean, but the capacity coupled tuner has it cheated cold in all these respects. It will eliminate all interference even down to C.W.'s. We are so located that probably we hear more broadcasters than any other section of the country, consequently we had our share of interference. But with this tuner I have listened to an entire program from KDKA perfectly eliminating all the

others. The majority of the readers of RADIO NEWS stick close to their Armstrongs, thinking them to be the best. This circuit does not need to be shielded, the capacity effects are very slight and regeneration can be brought up to its highest point without a sudden breaking into oscillation.

C. R. ANDERSON, Gowrie, Iowa.

TUTTI FRUTTI FROM CANADA

Editor, RADIO NEWS:

May I say just a few words, and then hold my peace?

Mr. Garrick certainly is right in saying that telegraphy is the thing. However, it doesn't hurt to have a phone transmitter working. I know several amateurs, both Canadian and American, who have excellent phone sets, but they seldom use them for voice nowadays, finding, of course, more pleasure in working DX with the key. If they want to "razz" spark coil QRM'ers, they can switch on the microphone and tell the children, in language which they can understand easier than the code, to sign off. (Sometimes the kids don't, though.)

I must agree with Mr. Hardenbergh, however, that there is a certain class of novices who will not learn anything about radio. True, many one-time phone novices have graduated into the ranks of the amateur, but right in my own city there are a few who have been following broadcasting for nearly two years and who have no more thought of learning the code than they have of flying unaided. I understand that there are a great many of this kind in the larger cities.

You mentioned once that "As far as the amateur is concerned radio telegraphy is on the wane." Now, I can hardly believe that you really meant this. Just hook up a Reinartz tuner tonight and listen to the mob of C. W. stations on the air. True, there are not nearly as many sparks as before, but the decrease is more than made up by the increased number of C. W. stations, which makes it better for everyone concerned, including the sparks. With less spark, QRM, it is easier to clear traffic on spark, and as any "wise" amateur will tell you, the times when one cannot raise anyone with C. W. are numerous. At the station in which I operate, Canadian 3DS, we are equipped with both spark and C.W. To date, we have only worked one station without previous schedule being arranged, on C. W., namely 8BCL, but the first night that the spark was installed, we worked about 15 stations. In fact, if I had a message to relay, I would not send it on C.W., unless I was able to raise someone in the city of destination.

It is quite right that the trick of "sneering at the public" and the "broadcasting misfits" is not the proper thing to do, but some of the performances of certain members of that class make a fellow want to do it. They usually merely make me laugh; such examples as Mr. Hardenbergh cites: "radios," "globes," etc. However, it is with pleasure that we note that a goodly percentage of the novices are starting to proceed along the right path. Several phone novices of this city have recently been inquiring as to "the best way to learn the code."

I am certainly glad to see Mr. Weaver of Hespeler given "hisn" by the Winnipeg *Free Press.* My only regret is that that illustrious journal did not hit harder. Mr. Weaver's letter was likely to give you people of the United States the impression that Canadians think that anything American is "rotten." I am pleased to state that this is not the case and that I have not spoken to anyone on the subject who did not disapprove of Mr. Weaver's letter. Of course, we have a gang of "nuts" here who think the way Mr. Weaver does, but I understand that the United States has a similar

Burgess, the Radio Battery
—construction fully patented

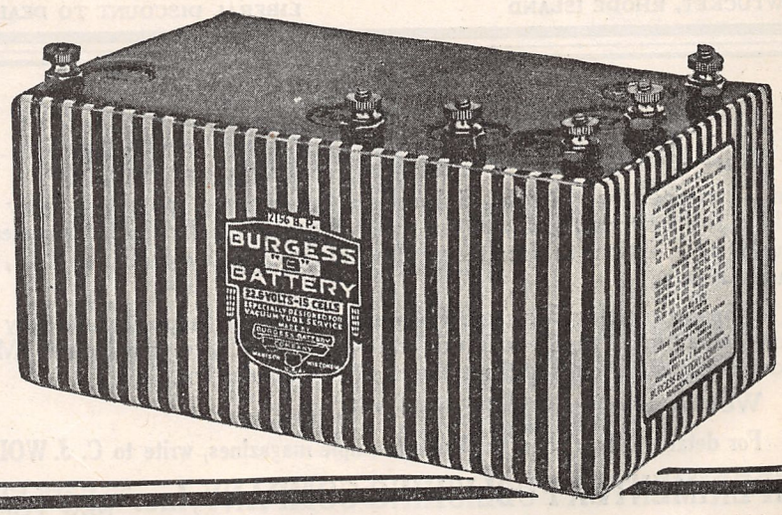
When you buy a Burgess "B" Battery you get more than long life, noiselessness, high capacity and moderate price. You get also Burgess special radio construction, perfected by wireless specialists and fully patented! This exclusive *radio* construction is found in no other battery on the market today.

What does this mean to users of radio batteries? It means clear receiving. It means lowest cost per hour of service. It means long shelf life and highest current capacity. It means that Burgess "B" Batteries are the best radio batteries it is possible to produce. Don't take our word for it—*ask any radio engineer.*

Leading manufacturers of radio equipment specify "Burgess." Burgess "B" Batteries are handled by all progressive jobbers and dealers. "Look for the Black and White Stripes." And if your dealer doesn't handle Burgess "B" just address:

BURGESS BATTERY COMPANY
Engineers—Dry Batteries—Manufacturers
Offices and Warehouses at:
CHICAGO, ILL., 111 W. Monroe St. KANSAS CITY, MO., 2109 Grand Ave.
ST. PAUL, MINN., 2362 University Ave. BOSTON, MASS., 136 Federal St.
NEW YORK, N. Y., 50 Church St. MADISON, WIS., Main and Brearly Sts.
In Canada: BURGESS BATTERIES, Ltd.
Winnipeg, Toronto, Montreal

BURGESS
"B" BATTERIES
"ASK ANY RADIO ENGINEER"



MARKO

"The Mark o' Quality"

for RADIO

ALWAYS DEPENDABLE

For sale by all reputable Radio Dealers and at MARKO Service Stations right in your own community. Made in all sizes and capacities.

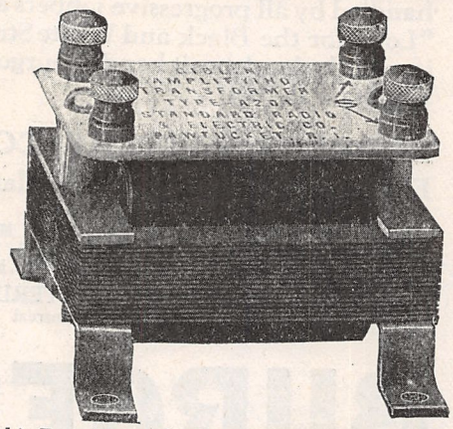
Guaranteed two years.

MARKO STORAGE BATTERY CO.

1408 ATLANTIC AVENUE BROOKLYN, N. Y.

Are YOU From Missouri?

MOUNTED $4.50



UNMOUNTED $3.50

In one month this Transformer has received approval from Maine to California

THEN TRY THIS

GIBLIN Audio-Frequency AMPLIFYING TRANSFORMER

Designed for use with standard amplifying tubes.
Maximum amplification without noise or distortion.
May be placed in any position without pre-magnetic coupling and squealing.

STANDARD RADIO & ELECTRIC CO.

PAWTUCKET, RHODE ISLAND LIBERAL DISCOUNT TO DEALERS

RADIO SALESMEN SAVE YOUR SPARE TIME!

Many successful Radio Salesmen in all parts of the country are making the most of their spare time and adding materially to their incomes by securing subscriptions to **Practical Electrics, Science & Invention,** and **Radio News.**

These popular magazines are growing in importance daily and a few hours "spare time" work will add very materially to your income. Many Radio Salesmen have made them a part of their regular line.

We pay a very liberal commission.

For details, subscription blanks and sample magazines, write to C. J. WOLFE,

EXPERIMENTER PUBLISHING COMPANY, Inc. 53 Park Place NEW YORK

faction who do nothing but condemn England, Canada, and all the rest of it, but no one pays any attention to them.

Speaking of galena detectors, I have tried one on a Grebe CR-3 tuner and they really work fine, if the operator has patience and a good crystal. Of course phones such as WGY, KDKA, WGR, WSB, WHAS, and KSD come through O.K. on crystal, but so do amateurs. Recently I heard 4GL's A.C. hum on crystal loud enough to read if I held my breath, 1,200 miles. How's that? Pretty weak, but it was there. The phones were Baldwin. But— I *prefer* the old bulb!

For the information of the "gang," I would like to mention that the *Daily Record* of Kitchener is broadcasting every Thursday night from 8 till about 10 p. m. Eastern Standard time until further notice. The call is CJCF and the wave 420 meters. The set is one with six tubes which can be used either as three oscillator, three modulator Heising-Hartley or six tube Hartley with grid modulation, 350 volts from a generator on the plates. The programs are composed mostly of local talent and Brunswick phonograph records are also used. The station has been heard as far as Detroit, but is only a temporary one, loaned to the newspaper by station 3DS, it being intended to purchase a regular high power transmitter in the near future.

H. S. Gowan, 3DS.
120 West King St., Kitchener, Ontario.

AN IMPROVEMENT

Editor, Radio News:

In this communication I shall not mention the *wonderful superiority* of the Radio News: All its readers are aware of that, hence no special mention is necessary. On the contrary, I desire to call special attention to a serious drawback, which is incorporated in the make-up of your magazine. It is not of any interest to those casual readers, who read a periodical of this type as one does a daily paper—in a hurry—and then consign it to the waste-basket, but to that class of readers, who read carefully and thoughtfully, and who desire to file away for future use, the valuable data and information contained within its pages, the situation is not viewed with pleasure. In order to file the reading matter, one is also *compelled* to file a lot of "junk" in the form of advertisements on paper which takes up space—adds weight and causes the files to be unsightly and cumbersome—with no redeeming features. Comparisons may sometimes be odious, but they may also be instructive as well. Take as examples the leading technical journals; in them the reading matter is confined to a central part of the magazine. As a concrete example see "The Iron Age," the leader of its class. The advertising matter is separately paged and indexed. Periodically an index of the reading matter is published and sent to subscribers, thus rendering available for instant reference the data and articles contained in previous issues. This index is in addition to the index published with each issue. While this would be a valuable convenience also, give us first the separation of the reading matter from the advertising matter, and second the periodical index—say annually or semi-annually. But *by all means,* give us separation of reading matter from advertising matter. Let us hear from others.

B. H. Reddy,
Long Beach, Calif.

(From time to time we receive communications similar to the above.

In the first place, Radio News *is not a trade publication like The Iron Age magazine. All up-to-date magazines use exactly the same make-up as used by* Radio News, *such as Saturday Evening Post, Cosmo-*

politan, American Magazine, and hundreds of others, all of which run text matter back through the advertising section.

It should be obvious to the reader that a first-class magazine whether it be Saturday Evening Post or RADIO NEWS, *can not hope to publish such a wealth of material and sell it at the price it is sold for, if the advertiser does not pay the freight. Now, then, when the advertiser is asked to pay the freight he must get something in return, and he insists that his ad be seen. That is only human, as well as natural.*

When a man buys a newspaper for 2c, or RADIO NEWS *for 25c, he must know that it is impossible to produce a newspaper or* RADIO NEWS *for the price asked for the copy alone. It can not be done.*

Therefore, the advertiser, who really pays for the paper bill, has a perfect right to ask that text matter be run along with the ads so that the reader will stand a chance of at least seeing the advertisement. In the long run, this has proven to be sound economics, and all successful newspapers and periodicals have found it necessary to use this make-up.

We can see where a newspaper reader or a fiction magazine reader has a legitimate complaint, but we can not see where RADIO NEWS *readers have a complaint whatsoever when it comes to the advertisements.*

In an industry that is growing as fast as Radio, the advertisements are considered news by the majority of the readers. There is not a day passing that we are not requested by readers to tell them of a firm that advertised such and such a thing six months or two years back. We know of many readers who are making an index of advertisements for future reference, proving conclusively that the advertisements are of value to them. On the other hand, it often happens that entirely new developments are advertised in RADIO NEWS *before such developments ever reach the text pages. That happened in a number of cases, and we are well aware of the fact that the readers saw these particular ads and acted upon them.*

But always remember that if it were not for the advertisements we could not give you one-half the reading matter we give you now. In October, 1921, RADIO NEWS *sold at 20c, and we gave you* 115 *columns of text. This October* RADIO NEWS *sells at 25c, and we give you* 251 *columns of text. In other words we increase the price* 20%, *but are giving you* 110% *more text. This increase of text is due solely to the advertising that* RADIO NEWS *carries. We believe it should convince every one.*

—EDITOR.)

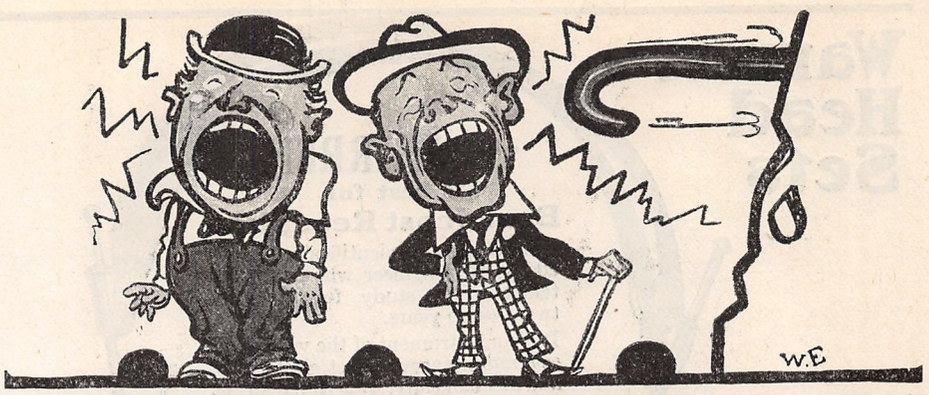
FROM AN "OLD-TIMER"

EDITOR RADIO NEWS:

I have just had an opportunity to glance through the September issue of RADIO NEWS, and was particularly interested in the comments on a recent letter published by Mr. Ralph R. Garrick. My interest was primarily centered in the communication of Mr. Ray Hardenbergh, of Minneapolis, and in your editorial comment.

I believe I may be classed among the earliest "old-timers," and it is in this capacity that I wish to add my comments to the hornet's nest which appears to be growing from Mr. Garrick's communication.

I am inclined to side with your views, inasmuch as I cannot see where the use of the ether was ever, or ever shall be, restricted to any one class of radio users While it has been conclusively prover that the telegraph men who actually handle traffic and carry on experimental work, are of undoubted value to the country as a whole, more so in fact than the average radiophone listener who "tunes in" merely for pleasure, still, it must be admitted, that through the medium of the radiophone

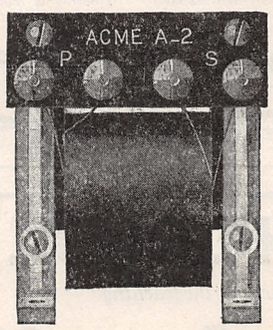


Choke off that "squawk"

AFTER all it is not always the bad vaudeville actors that "get the hook." Many owners have found an efficient hook to choke off the "squawk" of their radio sets and secure enjoyable music, by adding Acme *Audio* Frequency Amplifying Transformers to the ordinary detector unit. Acme Transformers cost but five dollars, yet the results are almost marvelous. Not only do they amplify sound, but they bring it naturally — realistically. They are necessary to the proper operation of the Acme Clear Speaker which enables a whole roomful of people to enjoy the broadcasting concerts.

In order to get more than one broadcasting station and thereby pick out the concert you like best, you should also add an Acme *Radio* Frequency Transformer. This greatly increases the range of your set whether it be vacuum tube or crystal detector type. This wonderful little transformer sells for the same price as its twin brother the Acme *Audio* Frequency Amplifying Transformer. Your set is not complete without both these transformers and the Acme Clear Speaker.

The Acme Apparatus Company (pioneer transformer and radio engineers and manufacturers) also make detector units, the Acmefone, Acme C. W. and Spark Transmitters, etc. Write for interesting Transformer booklet if your own radio or electrical dealer cannot supply you. The Acme Apparatus Company, Cambridge, Mass., U. S. A. New York Sales Office 1270 Broadway.



Type A-2 Acme Amplifying Transformer
Price $5 (East of Rocky Mts.)

ACME
for amplification

Warren Head Sets

The WARREN is best for Broadcast Reception

Our phones are scientifically designed by our Engineer who has made telephony a study for the past twenty-two years.

It is an instrument of the very highest grade in every respect, electrically and mechanically. It is the Head Set with the manufacturer's guarantee back of it.

2000 Ohms
$7.00
3000 Ohms
$9.00

Attractive discount to Jobbers and Dealers

WARREN

Specialists in Head Sets and Loud Speakers

WARREN RADIO PHONE MFG. CO. Inc
WARREN, RHODE ISLAND, U.S.A.

AUTOMATIC FILAMENT CURRENT ADJUSTER

$1.10 WITH MOUNTING

Eliminates Rheostats in all amplifying circuits.
Operates vacuum tubes at greatest efficiency without adjustments of any kind.
Automatically keeps filament at proper temperature thereby prolonging life of tubes from two to three times, and preventing "burning out."
Eliminates need of measuring instruments.
Easily attached, simplifies wiring, permits compactness, improves appearance of panels and sets.
Must be used in every vacuum tube circuit in order to insure continuous operation at maximum efficiency.

AMPERITE

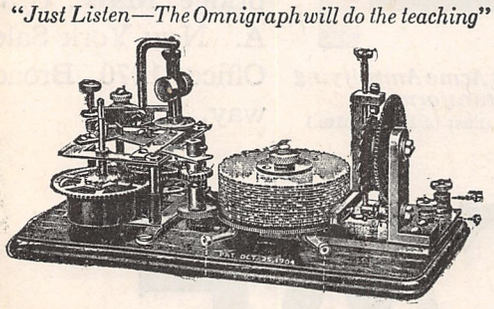
Used as standard equipment by leading manufacturers
Thoroughly approved by the most prominent laboratories in the country
Excellent trade proposition

RADIALL COMPANY
99 WARREN STREET
NEW YORK

LEARN THE CODE AT HOME

"Just Listen—The Omnigraph will do the teaching"

with the OMNIGRAPH



THE **OMNIGRAPH** Automatic Transmitter will teach you both the Wireless and Morse Codes—**right in your own home**—quickly, easily and inexpensively. Connected with Buzzer. Buzzer and Phone or to Sounder, it will send you unlimited messages, at any speed, from 5 to 50 words a minute.

THE **OMNIGRAPH** is not an experiment. For more than 15 years, it has been sold all over the world with a money back guarantee. The **OMNIGRAPH** is used by several Depts. of the U. S. Govt. —in fact, the Dept. of Commerce uses the **OMNIGRAPH** to test all applicants applying for a Radio license. The **OMNIGRAPH** has been successfully adopted by the leading Universities, Colleges and Radio Schools.

Send for FREE Catalog describing three models, $14 to $30. DO IT TODAY.

The Omnigraph Mfg. Co., 20 Hudson St., New York City

If you own a Radio Phone set and don't know the code—you are missing most of the fun

broadcasting stations, much more actual present good is being accomplished than is possible through radio telegraphy.

I say "present good," for instruction, education and amusement are being disseminated, daily throughout the country, and these have immediate effect on the listener. Of much more practical value during the World War, however, was the ability of so large a number of radio experimenters to telegraph as well as to intelligently handle radio apparatus. Radiophone broadcasting was practically unknown at that time, but it is really doubtful if it would be of great benefit during another struggle, other than in preliminary announcing of events to the entire country. This remains to be seen, should we be unfortunate enough to be called on to again take up arms.

My opinion would be that of any number of others, that there is a distinct place for BOTH telegraphy and telephony in the radio field, and both have their peculiar benefits, many of which are not commonly shared. It seems to me rather a childish argument, and very similar to the "town bully" (radio telegraphy) strutting about with a chip on his shoulder.

I maintain and operate a radio telegraph station of the amateur class, for pure enjoyment. I also occasionally operate the broadcasting station of our company. Of the two, I'd much rather "pound brass," but I hope that I am broad enough to grant half "the seat" to our new brother.

HOWARD S. PYLE,
Chief Engr., The Precision Equipment Co.
1802 Hopkins Avenue,
Norwood, Ohio.

A CORRECTION

Editor, RADIO NEWS:

On page 471 of the September, 1922, RADIO NEWS, we note in your Radio Crop and Market News Service schedule that you have station WOS listed as broadcasting market reports in code.

Kindly correct this to read as follows:

9.30 a. m., market reports estimated receipts Kansas City, St. Louis and Chicago. Live stock and optional grain market.

11.30 a. m., radiophone broadcast, same

2.00 p. m., radiophone broadcast, same.

5.00 p. m., daily marketgram from Washington, D. C., only.

Note, on the 5.00 p. m., broadcast will be omitted on Tuesdays and Saturdays.

We are now equipped with Western Electric Type 1-A transmitter, and as our range has greatly increased over our former 20-watt transmitter, we would appreciate your making this correction.

GILSON WILLETS, State Radio Engineer,
Jefferson City, Mo.

DEALERS, TAKE NOTICE

Editor, RADIO NEWS:

I am a constant reader of your magazine and want to say that I think it is just a little better than the best yet; but one thing I don't like is the way some of the advertisers have of charging me all the way from five to fifty cents for their catalogs and then not sending them at all. I have had that little experience with about 10 of the would-be firms and companies and I don't think I am the only one who has suffered at their hands, and it seems to me there should be some way found to show those sharks up, as it is not very pleasant to send money to men of their stamp and wait patiently for two weeks or more and then wake up to find out you have been "stung" again. It won't only hurt this magazine, but it will hurt the business of the old reliable firms for the new readers, after being stung once or twice will be somewhat shy of the whole bunch. I would like to hear from other readers through

your magazine if they have had the same experience that I have had. As a suggestion only, why not try, as some other magazines do, to accept only those ads that you know to be reliable and then we (the readers) will know what magazine to buy to find real firms to deal with.

R. L. ARMSTRONG,
Los Angeles, Calif.

(If readers will please give us the names of such firms, we assure speedy redress. Just try us.—EDITOR.)

CORRECTING AN ERROR

Editor, RADIO NEWS:

May we ask you to help us correct a very serious misstatement that appeared in your advertising columns, through an error? RADIO NEWS, we have observed, has always been scrupulously careful about the truth of statements made by its advertisers. It does this to protect its subscribers, and without doubt it is rendering a real service to its readers in exercising this care. For that reason any obvious misstatement that appeared and that would tend to weaken the faith of the subscribers in this policy of the magazine, ought—in justice to you—be corrected by the person responsible for the mistake, over his name.

An advertisement of the National Radio Institute was inserted in your October issue, telling of the opportunities that existed for young men to become certified Radiotricians—installing and repairing radios, etc. The National Radio Institute has turned out a great number of young men who are doing well in this line of business. In order to give evidence of the opportunities in this field, it was intended to insert in a panel in the advertisement a letter from certain young men who stated that they were now in business for themselves and were earning over $100 a week as Radiotricians. Under the panel was this caption, "The National Radio Institute will help you earn $100 a week as it helped these men."

The caption appeared as intended, but through an error *the wrong letter* was inserted over the caption. The letter that was printed was one written over a year ago by the Ship Owner's Radio Service telling of the opportunities with the United States Shipping Board *at that date.* This letter stated that men would be snapped up as radio operators as soon as they got licenses. This *was* true at the time the letter was written, but is no longer true since the slump in the shipping business.

A close reading of the letter would have shown that it did not belong in the panel, that it obviously was inserted in error, but unfortunately many people do not read carefully. An incautious reader might think the advertiser was deliberately trying to mislead the readers.

The error was observed in the proof, but your magazine had already gone to press and no correction could be made. In the interest of truthful advertising, in justice to your readers, to yourselves—and to the National Radio Institute, who themselves were not responsible for this mistake—we hope you will be good enough to publish this correction.

Sincerely yours,
SACKHEIM & SCHERMAN,
Advertising Agents.

Bank Opens Broadcasting Station

(*Continued from page* 1057)

"For more than a year we have been watching radio broadcasting closely, contemplating its service possibilities with increasing interest and respect and awaiting the time when radio broadcasting and receiving could be said to have 'arrived.'

No. 2500
2000 Ohms
$6.00

No. 2501
3000 Ohms
$7.00

Concealed Cord Tips

THIS is an important feature of the Manhattan Headset. Concealed Cord Tips have two real advantages:

The first is the elimination of all possibility of unbalancing the receiving set and decreasing the strength of the headset signals by having the hand come in contact with exposed cord tips or terminals. The loss of strength due to this contact is often as great as 50 per cent.

Manhattan Headsets have concealed cord tips.

By enclosing the cord tips, all obstructions on the outside of the receiver are removed and the smooth molded case will not scratch the handsomest furniture.

The Manhattan Headset case is free from obstructions.

In addition, the cords of the Manhattan Headset are designed with two other important features:

1. Strain on the terminals is relieved by a tie-cord attached to a small eyelet in the case.
2. The polarity of the cords is indicated and the terminals within the receiver case marked. This permits the headset to be correctly connected in the circuit to give the best results.

Manhattan Headsets are prized alike by professional and amateur operators. Identify them by the "M-Flash-Seal" on the back of each receiver case. Look for it when buying your headset. It is your guarantee of Manhattan quality.

MANHATTAN
ELECTRICAL SUPPLY CO., INC.

Makers of the Famous Red Seal Dry Batteries

New York 17 Park Place | Chicago 114 So. Wells St. | St. Louis 1106 Pine St. | San Francisco 604 Mission St.

AERIAL-A

WESSCO QUALITY

THE RADIO SET FOR YOUR HOME!

Aerial-A surpasses in selectiveness and strength of tone, machines of many times its price.

Designed especially for the layman, the Aerial-A set is the easiest to operate, and the simplest to tune, on the market.

Rich in appearance, compact, durable—this handsome set will add to the attractiveness of any home.

Aerial-A is easy to operate under all conditions—dampness and weather changes do not affect it.

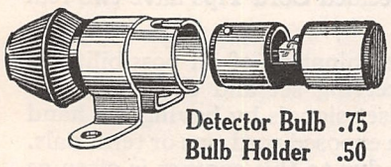
Price of Receiving Set $25.00

Manufactured by

W.E. Supply & Service Corp.

18 MURRAY STREET, NEW YORK

Big Improvements for Your Set At Small Cost



Detector Bulb .75
Bulb Holder .50

A New Kind of Detector

RADIUM JEWEL DETECTOR

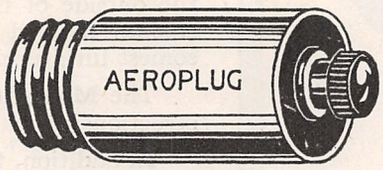
IMPROVED crystal detector, yet it requires no battery and no very little adjusting. Extremely sensitive. Occasional tuning is the only care required.

Steps up the efficiency of your detector set several times. Saves fuss and inconvenience. Worth a great deal more to you but you can buy it from most any dealer complete with holder for $1.25.

AEROPLUG—The Socket Aerial Eliminates Lightning and Static

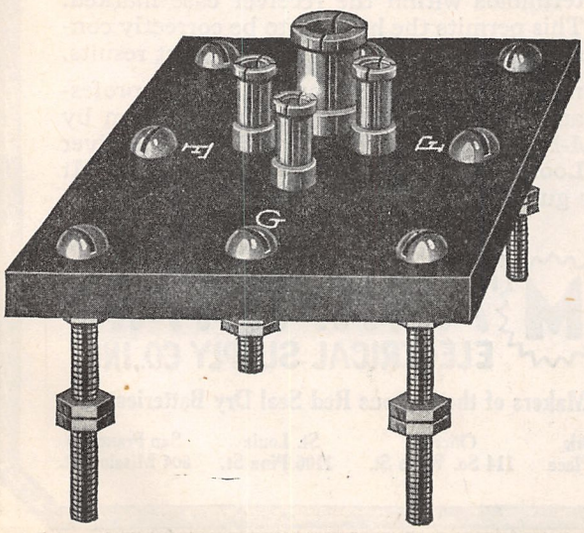
MAKES a powerful aerial of your electric lighting circuit, simply by screwing it into the ordinary lamp socket. Uses no current. NO danger. Can't get out of order. A good aerial in any kind of weather because lightning and static are absolutely banished. Made extraordinarily well.

Used for Crystal Sets Only When Close to Stations $1.50



If your dealer can't supply, we will mail direct

STAR MANUFACTURING CO. 868 BERGEN STREET NEWARK, N. J.



AERIOTRON WD-11 TUBE SOCKET

A socket for Aeriotron tube, type WD-11, with many advantages. Better connection is made by use of separate jacks for each tube prong, thus offering a positive contact surface. Jacks are mounted on polished bakelite base, cut convenient size.

Type B-2, price $1.25

Descriptive literature sent upon request

Ozburn-Abston Radio Co., Inc.

600-612 Monroe Ave.,
MEMPHIS - - TENN.

Today we, here at the Union Trust, believe that in radio there is a tremendous potential use and in establishing our new broadcasting station we are going to demonstrate that radio broadcasting today is an important cog in the industrial machinery of the country.

"I really feel that our broadcasting in its importance is second only to the introduction of rural free delivery for the farmer, and I make this statement advisedly, because through our radio broadcasting we will place the farmer in the position of a man with a private bond ticker in his office.

"More and more are profits in business becoming a matter of seconds. Fluctuations and tendencies are comparatively violent, and it is imperative that the business man not only in the city, but the modern business farmer, be in intimate contact with market tendencies and conditions.

"The enthusiasm with which our announcement of this broadcasting service was received, in itself, is an indication of the need for the service. It indicates that even with modern transportation, telephone and telegraph there is still room for improvement in the transportation of news, and that the bankers and business men within the broad reach of our broadcasting station appreciate the value of this final link in the chain.

"Very naturally we are proud of this new broad interpretation of banking service. We have bent every energy toward making it complete, authoritative and helpful, and we believe that our most sanguine hopes are realized and our analysis of the need amply justified by the enthusiasm with which the announcement of this new service was received."

WAJX employs a standard Western Electric Type 1A, 500-watt radio transmitter radiating eight amperes in the antenna on 360 meters.

The aerial is 375′ above the street, resting on a 125′ tower on a 15-story building and is believed to be the highest aerial in Northern Ohio. J. M. Thorburn is the expert in charge of this station, and is highly pleased with the tests made.

WAJX has now been heard in Little Rock, Ark.; Green Bay, Wis.; Knoxville, Tenn.; Raleigh, N. C.; Newport News, Va.; Camden, N. J.; New Britain, Conn.; Mannington, W. Va.; Philadelphia, Pa.; New York, N. Y.; and other distant stations. All report that the station was heard plainly and comment favorably on the modulation.

More Comfort for the Flyer Passengers

(*Continued from page* 1057)

by WSY station of the Alabama Power Company and hundreds gathered at the station to view the radio car and enjoy the concert. Along the route on the initial trip newspaper men were invited to go aboard and inspect the car, which is handsomely fitted up.

In Montgomery a concert was given as sent out by the Alabama Radio Manufacturing Co., of that city. In New Orleans the concert of the *Times-Picayune* was particularly clear.

Superintendent Hobbs explains that there are some things yet to be worked out, especially with reference to grounding and the variations of altitude encountered on the trip. But he gives assurances that the L. & N. expects to make a feature of the radio coach, which will give passengers something else to do besides twiddle their thumbs or injure their eyes reading while on the cross-Dixie trip.

YOU BET

Edison thinks radio may put us in touch with spirits in the next world. The device would be more popular if it could be arranged to put folks in touch with the "spirits" in this world.

By A. J. de Long.

A Few Facts About Modern Arc Transmitters

(*Continued from page* 1051)

employ the old "compensation wave" or, as it is known in Europe, the "space wave" method of signaling. Signaling by this method is accomplished by means of varying slightly the inductance of the antenna loading inductor which results in a change in the wave-length transmitted. This method of signaling is so well known it requires no comment here. With signals so transmitted, the ease with which they are received depends upon the amount of wave-length change and upon the expertness of the operator in adjusting his receiving instruments.

It is true that many high-power arc stations in use at present are so connected and operated and it is also true that arcs so employed do cause a certain amount of interference from "mush" and overtones, but the arc is not alone in this regard by any means.

This much is common knowledge among the radio fraternity, but what is not known is the fact that in modern arc transmitters practically 100 per cent of the interference so much complained of has been eliminated. Single wave transmission has been proven practicable in the highest-powered stations and its use not only results in the obvious improvement of signals, but at the same time assists in the elimination of the undesirable interference noted above and eliminates the key troubles experienced in stations using the compensation wave. Furthermore this is not entirely new.

In April, 1920, a 60-K. W. arc station in the vicinity of San Francisco was equipped with a temporary single wave transmitting system and tests were conducted between that station and Honolulu extending over a number of weeks. The results from the start were excellent. Honolulu reported signals stronger and more easily read than usual, while the direct current power input was considerably reduced. An unexpected result and one that was of great importance was the reduction of interference on short waves in receiving stations operating within a distance of from 3 to 10 miles. This was the first practical demonstration of a single wave signaling system applicable to high-power stations. Since that time further developments in the arc and its attendant circuits have been made which produce results surpassing those obtained during its first practical test in 1920.

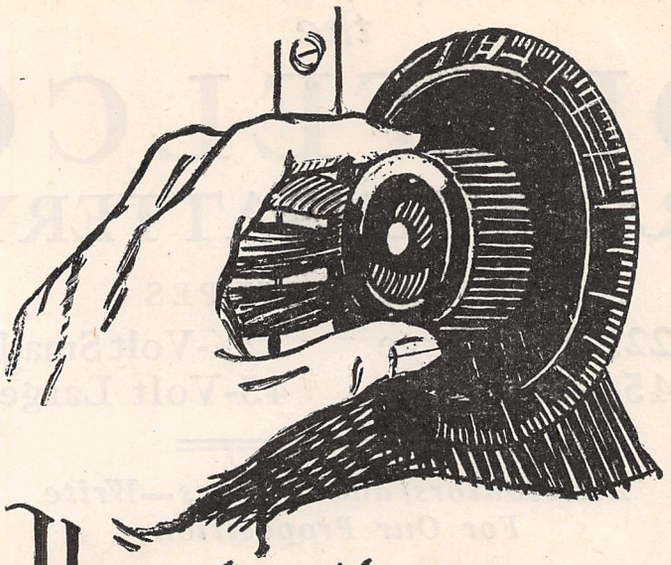
It is well known that it is difficult to successfully operate a number of closely associated transmitting antennae, especially when they are operating on wave-lengths not widely different, nevertheless this has been accomplished by the aid of the circuits to which reference has been made.

The most notable practical application of the improved arc transmitter is found in the stations of the Federal Telegraph Company operating radio circuits between San Francisco, California and Portland, Oregon, and San Francisco and Los Angeles.

Of the Federal stations the most interesting is that erected near Palo Alto, Calif., and operated from San Francisco, a distance of about 30 miles, as this station demonstrates strikingly the results of the research and development of the arc made by this company.

Actually the Palo Alto station, known as the Marsh Station, is within itself, the equivalent of six stations.

There is but one 600-foot mast supporting six antennae, each being fed by a separate arc converter, all converters being supplied with D. C. power from a single motor generator set.



How to stop noises when you touch dials

Have you ever noticed in tuning a radio receiving set that when you touch dials, knobs or switches it causes a humming or whistling noise? It is annoying, isn't it? These distracting sounds will disappear if you install dials, knobs and other parts made of

RADION

Tests by disinterested laboratories have shown conclusively that RADION is without exception the best material for radio parts and panels because it comes closest to being the perfect insulation.

Have you tried RADION? If not, secure a dial or other part from your dealer today. Take it home and experiment—that's the best way to become convinced of its unusual qualities.

And while at your dealer's, ask him to show you a RADION Mahoganite panel. Its beautiful mahogany grain will please you. It won't warp and is easy to work. If your dealer cannot serve you, write us direct for all information, giving us his name.

Dealers are invited to write for lists

AMERICAN HARD RUBBER CO.

11 Mercer Street, New York

Announcing the

DELFELCO

RADIO "B" BATTERY

VARIABLE TYPES

22½-Volt Large — 22½-Volt Small
45-Volt Baby — 45-Volt Large

Distributors and Dealers—Write For Our Proposition

DELFELCO BATTERY CORPORATION
28 Bayley Street - - Pawtucket, R. I.

"ILLINOIS" THE RELIABLE

CONDENSER THAT IS MADE RIGHT AND STAYS RIGHT

	Panel	Cased		Panel	Cased
67 Plates.....	$7.00	$8.50	23 Plates.....	$2.75	$4.00
43 Plates.....	3.50	4.75	13 Plates.....	2.25	3.50

Vernier with single movable plate applied to 13, 23 or 43 sizes, $2.00 extra.

Above list is for our Regular Style with Knob, Pointer and Scale. We also furnish the Condenser with smooth 3-16 inch staff suitable for Dial at 15c off list.

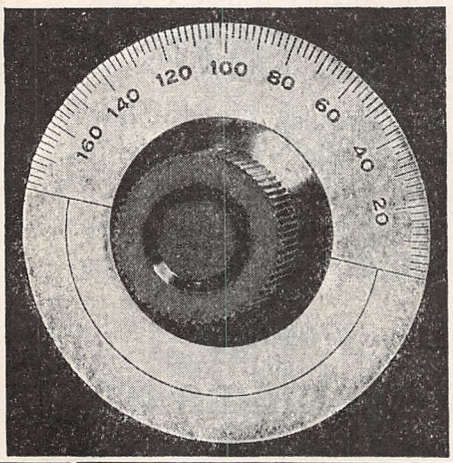
A 3-inch Bakelite Dial with Condenser, add 50c to list.

Fully Assembled and Tested. IMMEDIATE SHIPMENT.

Money back if not satisfied. Just return within 10 days by insured Parcel Post. Sent Prepaid on Receipt of Price, Except: Pacific States, Alaska, Hawaii, Philippines and Canal Zone, add 10c. Canada, add 25c.

No Discounts except 5 per cent on orders of 6 or more. Send for Bulletin.

G. F. JOHNSON, 625 Black Ave., Springfield, Ill.



Somerville Dials

aside from their distinctive beauty and correct proportions may be grounded to draw body capacity away from the instruments.

Made to fit 3/16" and 1/4" shafts, 4" Dial, $1.75 3¼" Dial, $1.00

Somerville Terminal Tags—*Now 5c. each*

Fit under the binding post like washers thus eliminating engraving. Stock readings are:

ANTENNA	MODULATION
GROUND	HI-VOLTAGE +
INPUT	HI-VOLTAGE −
OUTPUT	LO-VOLTAGE +
TICKLER	LO-VOLTAGE −

By Mail or from Your Dealer

SOMERVILLE RADIO LABORATORY
REMOVED TO LARGER QUARTERS AT
43 CORNHILL ST., BOSTON, MASS.

OUR "OK" ON EVERYTHING WE SELL!

All arcs are started, stopped and adjusted by remote control and all are under the care of but one attendant.

They work on the single wave principle and are equipped with special circuits which so reduce the mush and overtones that by using a four-wire antenna 600′ long and 100′ high at the Federal factory two miles distant with an audion detector and two stages of amplification, no interference is noted when receiving the music broadcasted by stations in the vicinity of San Francisco or when receiving signals on 600 meters.

Being supported by a single mast the six antennae are necessarily very closely associated and operate on wave-lengths between 3,175 and 7,700 meters without any detrimental interaction that can be detected by the receiving stations; that is, any one of the channels being received by a distant station is not affected either as regards strength or quality of signal or wave-length when any one or all of the other five channels are operating, or shut down.

Three of the channels send to Portland, Ore., an air line distance of 558 miles, and three send to Los Angeles, a distance of 337 miles. The combined full rated power of all six converters is 77 K. W., nevertheless with a total D. C. input of from 38 to 40 K. W. for all transmitters, signals at Portland and Los Angeles are of sufficient strength to enable the exchange of radiograms at the rate of 30 words per minute throughout the day. This demonstrates the remarkable increase of efficiency of the new arcs over those at present in use in most stations.

The reliability of the service may be gauged by the fact that the station has been operating ten to twelve hours daily for about a year, thus proving it 100 per cent reliable, and with its great reserve power capable of maintaining communication through the adverse atmospheric conditions of the summer months.

The stations at Portland and Los Angeles are each equipped with three transmitters similar to their corresponding channels at the Marsh Station, and would be unusually interesting and unique but for the fact that the Marsh Station operates double the number of transmitters simultaneously.

The above description of the Federal Company's Marsh Station has been given for the purpose of setting forth what has been made possible by the use of the improved arc transmitters more clearly than could be done by a mere description of the apparatus used. Actual results are what count most.

Among the more recent improvements may be mentioned an automatic arc striking and adjusting device which makes possible the control of an arc at a distance of miles.

While the six transmitting units at the Federal Company's Palo Alto Station are at present handled by remote manual control from a distant part of the same building it is quite possible that in case of the erection of another station similar to the Palo Alto Station arrangements would be made for controlling the entire plant, starting and stopping the various units by remote electrical control. The arcs would of course be equipped with automatic striking and adjusting devices, rendering unnecessary the services of an attendant, and the station would operate in the same manner as the present transformer sub-station installations.

The idea of a radio station so highly specialized as to operate simultaneously without interaction six separate antennae supported by a single mast is a novel one. Add to this the remote electrical control of such a station from a distance of miles, and it becomes worthy of the imagination of H. G. Wells or Jules Verne; nevertheless the practical operation of a station in this manner is not so far distant as may be thought.

The accompanying photographs show the single mast and building at the Federal Telegraph Company's Palo Alto station and

the battery of six transmitting units installed within the station building.

The engineering department of the Federal Company has well defined plans for the remote electrical control of a station similar to the one described in this article, and within a few years it may be a common thing to find in many parts of the world stations of this nature requiring the presence of an attendant for but a few minutes per day once or twice a week.

Going to Jail With the Radio Telephone

(*Continued from page* 1051)

mechanical "tongue" of vocal speech and music were not in question—the radio telephone having demonstrated its merits in this particular in sundry ways and countless times before. The warden of the jail had expressed doubt that a radio-receiving outfit of reasonable construction and price could disseminate speech and music to the farthest ends of the spacious structure.

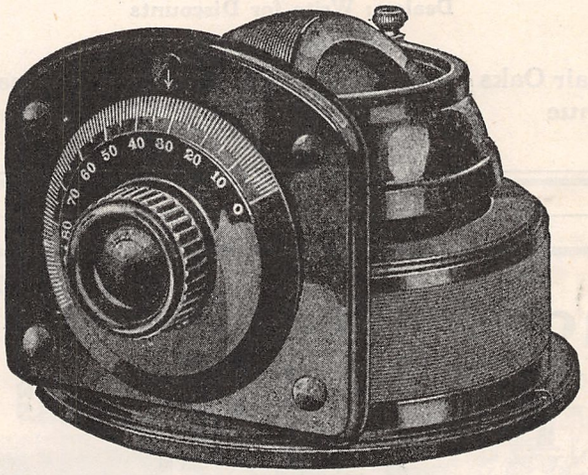
From the center of the rotunda of the District of Columbia jail, in three directions, there are approximately 200′ of space each way. The wings of the jail, where the prisoners repair after dark to their individual cells, are four tiers high. About 320 persons are thus imprisoned. In the middle of the rotunda the experimental radio installation was made. A loop antenna, two stages of amplification, and a loud-speaking horn were the visible and outstanding units of the wireless equipment which made possible the broadcasting of concerts to the uttermost corners of the building. W. L. Peak, warden of the jail, repaired to the topmost row of cells while the entertainment was in progress. Here he heard in audible strains the concert being given by the band of the United States Navy Department, the Anacostia Naval Air Station, "NOF," broadcasting this form of entertainment on Friday nights.

Mr. W. L. Peak, a kindly man whose experience with penal institutions extends over a decade or more, explained to the writer that no permanent installation of radio-telephone apparatus had been as yet authorized for use by the District of Columbia jail, widely published newspaper reports to the contrary. The bill of appropriation covering expenses at this institution does not carry any provision for this form of entertainment. The newspapers that heralded his generosity in purchasing a wireless receiving set, as well as reports that the outfit was acquired through popular subscriptions of the prisoners, are not in accord with the facts. The warden is inclined to believe that some charitable organization in Washington will provide the 320 inmates of this prison with facilities for this form of amusement. The Episcopal Community House, through its representative, Mrs. David Covell, has expressed keen interest in the contemplated permanent radio-telephone installation. The cost of the complete outfit would approximate $250.

"I believe every penal institution in the United States will eventually install a wireless receiving set," said Warden W. L. Peak, in contemplating the advantages of the radio-telephone to the inmates of prisons whose lives are now a dreary desolation. He cited the illustration of a prison in Atlanta, Georgia, where William H. Moyer, general superintendent of all penal institutions in the country, has extended to the inmates the opportunity of playing stringed musical instruments each evening between 7 and 8 o'clock. The salutary effect on the lives of the prisoners is wonderful. Then, is it not to be expected, reasons Mr. Peak, that the introduction of the wireless telephone within prison walls will have a wholesome influence on the morale of persons whose past actions and present existence plague them through the waking hours.

ATWATER KENT

COUPLED CIRCUIT TUNER



Price $14.00

¶ *Simplest operation — maximum performance.*

¶ *Takes the place of variometer and coupler.*

¶ *Accomplishes the results with but one adjustment.*

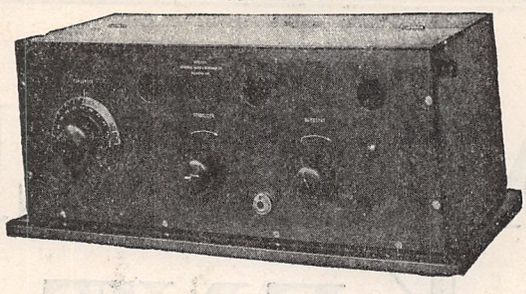
¶ *It is absolutely unaffected by body capacity at dial knob.*

ALL INSULATING PARTS ARE STURDILY MADE OF MOULDED CONDENSITE AND THE WORKMANSHIP THROUGHOUT IS OF THE HIGHEST QUALITY.

An Excellent Merchandising Proposition

ATWATER KENT MANUFACTURING COMPANY
4943 STENTON AVE. *Radio Department* PHILADELPHIA, PA.

Type R-310



DX-1 Transformers

Used with Myers Tubes

THREE STAGE RADIO FREQUENCY AMPLIFIER

Adaptable for

LOOP RECEPTION

with

Detector and Tuning Condenser $125.00

Dealers: Write for Discounts

199 So. Fair Oaks Avenue

UNIVERSAL RADIO & RESEARCH CO

Pasadena, Calif.

Enjoy it Together — with a TIMMONS TALKER

Let your family, and friends, too, if you like, enjoy the radio program with a real Radio Loud Speaker.

Built in a handsome mahogany case that looks well with any receiving set. Adjustable amplification, you can control the volume to suit any taste. No batteries necessary.

Price

$35.00

If your dealer cannot supply you write to us. Send for booklet.

J. S. TIMMONS

Germantown, Philadelphia, Pa.

BAKELITE

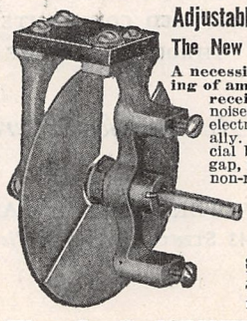
RADIO PARTS

Moulded To Your Design

Northern Industrial Chemical Co.

11 Elkins St. Boston, Mass.

Moulders of Electrical Insulation



Adjustable Vernier Condenser

The New "WHITE" Type 1VC

A necessity for the sharp tuning of amateur and broadcast receiving sets. Absolutely noiseless. Highest grade, electrically and mechanically. Superior features, special bearing, adjustable air gap, no contact springs, all non-magnetic materials.

Price, postpaid, $2.50

Special proposition for Dealers and Jobbers. The best selling device now on the market.

The O. C. WHITE COMPANY

15-21 Hermon Street, Worcester, Mass.

The experimental installation of a radiotelephone receiving outfit in the District of Columbia jail has conclusively demonstrated the feasibility of this form of entertainment in penal institutions throughout America. The funds with which to purchase wireless equipment are not available, nor do bills of appropriations recognize such claims. Hence, means for providing this kind of diversion will have to be sought from outside sources. Charitable organizations may be logical sources of financial assistance. Or some philanthropist interested in prison reform might endow a fund whereby American penal institutions could acquire wireless apparatus for permanent installation.

Once the inmates of prison walls have nightly access to a diverse musical program, their minds would be diverted from the sordid experiences of past performances and gladened by the burdens of song and story borne into their cells by electric waves. Instead of gloom enveloping their very existence, it is not unreasonable to contemplate that they would develop into radio fans and daily exercise expressed preference for the offerings of particular wireless transmitting stations. The "tuning out" of one station and the "tuning in" of another would make of brick walls and a depressed atmosphere an avenue for contact with the cheer and sunshine of the big world beyond the prison gates.

A Ten-Watt Set With a 1000-Mile Working Radius.

(*Continued from page* 1080)

side of which, is shunted across to the positive lead, a 1-MF. filter condenser. These should be tested and able to stand at least 750 volts.

The inductance L-2 is a high frequency choke coil. A 300-turn duo-lateral is the best size for this purpose.

The antenna inductance L-1 consists of 25 turns of edgewise wound copper strip, 7 inches in diameter; 25 turns of No. 12 bare copper wire, wound on a grooved bakelite tube, and separated 3/16-inch will serve exactly as well.

C1 is a 43-plate variable condenser such as is used in receiving sets, and C2 should be a 23-plate condenser of the same type. If more than 500 volts are used on the annodes, difficulty may be experienced in sparking between the plates, in which case condensers with greater spacing should be used.

The grid-leak is a variable graphite potentiometer. In place of the small graphite tip, the author soldered a piece of copper braid, 1/4-inch long to the contact lever, thus securing positive connection with the graphite at all times.

The secondary of the modulation transformer is connected in series with the grid leak, and the telephone transmitter, connected in the usual way to the primary. A D. P. D. T. switch throws from this to buzzer modulated when desired. The key for telegraph work is placed in the lead from the center tap on the filament winding to the ground. This does away with the danger of shock or burn while operating, and also does not burn away the contacts, as is the case in the high voltage circuit.

For connecting up the set No. 14 bare copper wire is used. The wires carrying the filament current are insulated, No. 16, and the flexible connections to the inductance clips are heavy rubber-covered lamp cord.

The instruments are mounted on a bakelite panel, 15 x 18-inch and 1/4 inch thick. The tubes are mounted in a vertical position, and in such a way that at any time one or more may be added. With two UV-202 or C302 G. E. tubes, the radiation obtained at 6AWP is 1.7 amperes on 200 meters using a counterpoise ground.

In the adjustment of the set, it is advisable to have the plate tap on the inductance five or six turns above the antenna tap. The key is closed and the ground series condenser adjusted until maximum radiation is obtained. The capacity of C2 is now decreased to a point just above the "break" of oscillation. The radiation continues to rise up to this point, but on passing it, drops to 0. A final adjustment of the grid leak may increase the radiation to a slight extent. The adjustments of the grid condenser and grid leak are rather critical, especially when the phone is used.

The filaments are connected in parallel and a constant voltage of 7.5 maintained.

The C. W. transmitter described above has proved exceedingly easy to adjust and operate. The results obtained far surpassed even the best hopes of the owner. The whole trick seems to be in the careful adjustments of the instruments to maximum output. Simplicity was carried out to the fullest extent to make this adjustment easier.

The greatest joy in the work of an amateur comes in conquering distance—talking hundreds or even thousands of miles on a set of low power. The little C. W. surely "delivers the goods."

Who's Who in Radio

(*Continued from page* 1070)

Armstrong reasoned that if it were possible to get beyond that point, without getting this hissing sound, amplification could be infinite. And so, he started to experiment, to try to remove this objection. The results of these experiments were disclosed in his famous paper on "Super-regeneration," read before the Institute of Radio Engineers in June, 1922, and published in the October issue of RADIO NEWS.

This is the last step in the rapid advance of the radio art. With the new super-regenerative receiver, it is possible to get the results previously obtainable with from four to six steps of amplification, with but two vacuum tubes.

Edwin H. Armstrong has for many years been associated with that big body of representative radio men, the Institute of Radio Engineers. He was president of the Radio Club of America. He is at present a professor at Columbia University, from which he graduated in 1913 with the degree of Electrical Engineer, where he is conducting more experiments modestly, for the advancement of the radio art. He is one of the very few radio engineers who have risen from the ranks of the radio amateur. He is fundamentally a radio amateur at heart, as his interest in the recent Transatlantic tests show. He was indeed one of the designers and constructors of station 1BCG, which was heard in Scotland.

Inductance and Capacity

(*Continued from page* 1088)

capacity is endeavoring to reverse the rotation and the rod will momentarily come to rest. At this instant the force with which it is tending to untwist will be at a maximum, while the momentum of the lead disc will be zero, hence the rod will begin to rotate backward. When it has reached its original position, it will have untwisted and its force will be nil, but the lead disc will be moving at a good speed and will cause the rod to rotate beyond its normal position of rest, until finally it is stopped by the action of the spring. The rod will then start swinging back again. This oscillating motion would continue forever if there were no resistance at the pivots and no air friction or friction in the spring. In practice, however, the rod will eventually

New Radio Enjoyment

—at an amazing, low price

NOW comes this new Speaker, the *Master*-Baldwin *"Throatype"* Clarophone which means new radio enjoyment. It enables a roomful of people to hear distinctly any broadcasting that your receiving set will catch.

New in design, it is more perfect in execution, because it combines the famous Baldwin Phone with a scientific, throat-like speaker.

You know the Baldwin Phone, used wherever most exacting work is done. It has been selected by the United States Bureau of Standards as the standard radio phone.

The United States commandeered the Baldwin factory during the war to assure Baldwin Phones for War Vessels, and Army and Government stations.

A Clarifier—Not an Amplifier

Now this finest phone is combined with a new scientific speaker which enables you to hear distinctly every word or note—hear the overtones, even the harmonics. No rasping, buzzing, breaking or any noise for which your receiving set is not responsible.

Designed like the human throat, the speaker has the same tone chamber. And the top part is fashioned after the roof of the mouth. Both are shaped in non-resonant metal.

It has the rectangular mouth, following the principle that opera singers know and use. For getting full resonance they always square their mouths in singing—never round them.

The vocal chords are represented in the Baldwin Phone by a marvelous mica disk, unaffected by heat or cold or electric currents, which is actuated in both directions by an armature tone-arm superimposed in a magnetic field.

So the *Master*-Baldwin *"Throatype"* Clarophone follows accurately the most perfect model ever made. To hear one is to want one.

Why We Can Sell It For $22.50

Because of its simple but scientific design the Clarophone lends itself to large quantity production which enables us to sell it for $22.50—an amazing price.

And the *Master*-Baldwin *"Throatype"* Clarophone is the world's standard quality—remember the Government selection of Baldwin Phones.

Try It at Our Risk

We know that the Clarophone will please you. So we invite you to test it for ten days at our risk. If you are not pleased, your dealer will gladly refund your money.

Ask your dealer for the *Master*-Baldwin *"Throatype"* Clarophone.

If he hasn't it, order direct from us, enclosing $22.50. We will ship immediately, charges prepaid, a complete Clarophone to you. (Reference: Citizens National Bank, Los Angeles, Calif.)

Try the Clarophone. Know the real pleasure it will give you.

The *Master*-Baldwin "Throatype" Clarophone
REG. U.S. PAT. OFF.

Unequalled Low-Priced Offers

The Master-Baldwin "Throatype" Clarophone, Complete - - - - **$22.50**
Described above.

The Master-Baldwin Phone - - **$ 9.00**
The genuine *Master*-Baldwin Improved Phone manufactured by the Baldwin Radio Co., Salt Lake City, Utah.

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The standard supersensitive head-set for those who want the double phone.

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Master Radio Corporation,
Dept. 6012, 631 So. Spring St.,
Los Angeles, California.

Enclosed is $22.50 for one *Master*-Baldwin *"Throatype"* Clarophone, charges prepaid, insured. My money to be returned if I am not satisfied. I buy my radio equipment from

(DEALER'S NAME).....

(Address).....

(YOUR NAME).....

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Why

by sorting, dusting and cutting our own rags we make better fibre

To be sure this is a tedious operation, but one authority has said "Fibre, good or bad, is made in the paper mill." We, of course, try to be careful in all operations concerning *VUL-COT* Fibre as we are in making the paper.

You see, if we didn't make sure that the rag stock were free of foreign substances, a piece of wire or perhaps a pin or nail might show up after some time had been spent in machining or finishing a piece of fibre. This would mean costly labor wasted.

We are always glad to guarantee *VUL-COT* Fibre to be free of foreign substances. Incidentally, this care which we take in making the paper used in *VUL-COT* Fibre increases its dielectric strength and lowers dielectric losses.

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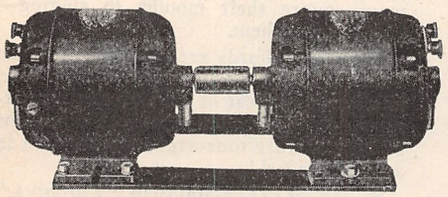
"Make it of VUL-COT Fibre"



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Best Value ever offered for - - - $35.00 f. o. b. Chicago

Converts Alternating current electricity to Direct current and steps down the 110- or 220-volt line-current to 8 volts—the proper voltage for charging lead-acid batteries.

Set consists of our regular ¼ h.p., 110 volt, 60 cycle, split-phase, fan-cooled, Alternating current Motor, direct-connected to our standard ¼ h.p. Direct current Generator. Both units are standard and time-tested.

With this set the regulation 6-volt, 80-ampere radio "A" battery can be fully charged in from 4 to 8 hours, depending upon the degrees of its discharge. Simply plug in motor generator set to your electric light or power line, and connect leads to poles of the battery.

You will not be able to secure a set of equal capacity from any other source at much less than double our price of.....**$35.00**

Northwestern Synchronous Generator for operating Spark Gap in broadcasting, ⅛ h.p., 110 volt, 60 cycle, split phase A.C.....**$20.00**

Northwestern High-Power Motor Generator for Broadcasting Sets furnished for either Alternating or Direct current service.....**$100.00**

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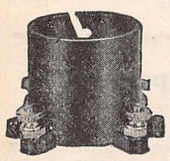

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small space
V. T. Socket

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COTTON AND ENAMEL WIRE ON ¼-½-1 LB. SPOOLS

Antenna Wire Ground Wire

BULB LIGHTNING ARRESTER

Specialists 40 Enamel

Metals & Insulation Co. of America

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be brought to rest. The above represents the discharge of a condenser with large inductance and small resistance, the condenser being alternately charged and discharged until the energy has been dissipated in heat, the several chargings and dischargings being the result of one initial charge.

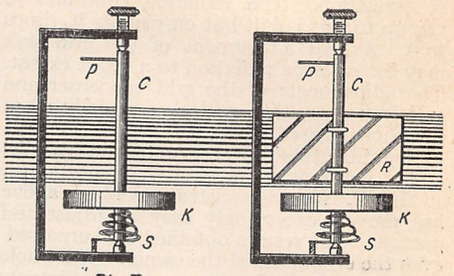

Fig. 7 Fig. 8

A Mechanical Analogy of a Circuit Containing Capacity, Inductance and Resistance.

Fig. 8 represents a circuit possessing capacity, inductance and resistance. On rotating the rod and then allowing it to untwist, the effect is similar to that of the previous case, except that the swinging is "damped"—that is, the oscillations rapidly decrease and soon cease. This is equivalent to discharging a condenser through a circuit possessing inductance and large resistance, and the greater the resistance the less the number of oscillations.

—Abstract from *Amateur Wireless.*

Some Experiments on Very Short Waves

(*Continued from page* 1082)

These instruments will be found quite critical to length. Generally the receiver will be shorter, a difference of one inch in length being sufficient to vary the strength considerably. For experimenters desiring more effective instruments, the system in Fig. 5 is suggested. Here a seamless brass telescope tube ⅛ inch inside diameter is cut 15 inches long for each rod of the transmitter (30 inches for receiver). A slot at F provides a friction junction upon the ⅛ inch brass rod G 15 inches long that slides into the tube. These rods may be pulled out so that either of the systems may be extended for critical tuning or changing of wave-length.

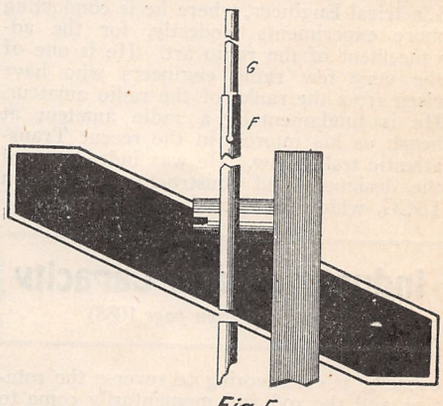

Fig. 5

A Type of Adjustable Rod Permitting the Variation of Wave-Length.

When operating with such short wavelengths, many interesting experiments may be performed. With such crude receivers a distance of several hundred feet may be covered when employing a one-sixteenth-inch spark-coil at the sending unit. The devices possess remarkably sharp directional properties and provide an excellent method of studying the angle of propagated waves where they are originating from different heights and angles.

Amateur Wireless in Australia

(*Continued from page* 1076)

Another feature of the receiver is the inclusion of an independent oscillator which acts as a heterodyne. In this manner much greater control can be attained with increase in signal strength and correspondingly greater selectivity.

On the night of May 21 last, while conducting some tests in wireless telephony with the Sydney Observatory, using only a 9-watt input, Mr. Maclurcan was heard in Melbourne, 450 miles distant. A telegram was received the following day from Mr. J. Reed stating he and several amateurs in Melbourne had heard the carrier wave on the previous evening.

Mr. Maclurcan arranged to try and establish definite communication with Mr. Reed. The test was quite satisfactory.

Encouraged with the Melbourne success, Mr. Maclurcan made arrangements with Mr. Dixon, the wireless operator on the "*S.S. Montoro*"; while this boat was proceeding north from Sydney, Mr. Dixon wired the following:

"10 p. m. June 3d. 420 miles telephone strength six continuous wave and tonic train strength eight.

"10 p. m. June 4th. 705 miles continuous wave strength six."

Mr. Dixon was using one valve with standard ship's equipment.

Brief mention was made of these results in the daily press with the result that amateurs in the country and operators at sea immediately took the keenest interest, with the result that Mr. Maclurcan commenced broadcasting every Sunday evening. Amateurs all over the country are now receiving these concerts and reports are daily coming to hand from further and further afield. Music is being enjoyed from experimenters as far as 600 miles away, and considering Mr. Maclurcan is only using 8.25 watts, the results, to say the least, are very encouraging.

An extract from a letter received from Mr. Hull in Melbourne will probably be of interest in this connection.

"Was not able to listen for you until 8.40 p.m., and my accumulator was on its last legs.

"Upon switching on, however, reaction at zero, your music was excellent, readable at arm's length, to my intense surprise. At this stage of the proceedings the accumulator began to peter and I was obliged to switch off to give it time to pick up.

"At about 8.55 the record 'Mon Homme' was of similar strength to the above and I enjoyed the whole of it. Toward the end of the piece the accumulator gave up all hope."

In order to fully appreciate these results of Mr. Hull it should be known that the receiving aerial consists of two wires 30′ long supported by the eaves of the house 20′ high and brought down to the edge of the workshop 10′ high. The whole aerial is below the level of the house and according to our ancient ideas he should be completely screened from anywhere. Instead of which Mr. Hull on this very inefficient aerial receives music and speech from a transmitter 450 miles away using less than nine watts.

The writer is appending the circuit employed by Mr. Hull as it presents several novel features. By referring to this diagram it will be seen that only two valves are used and made to function as radio frequency amplifier, detector and audio-frequency amplifier, thus doing the work of three. The writer has carefully tried out this circuit and finds it the best 2-valve circuit he has yet used, so some readers will doubtless be interested also in trying it.

Mr. Maclurcan has just completed some

USL
U.S. Light & Heat Corporation

Radio "A" and "B" Batteries in Hard Rubber

"A" Batteries—One Size Only

6 Volts—75 Ampere-hours

Case—Hard Rubber
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Plates—Positive 1/4"
Negative 3/16"
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Separators—Port Orford Cedar 1/4"
Cover Bushings—Non-Leak
Connections—2, 4 or 6 volts

LIST PRICE

Charged—Ready to Use

Battery and Handle.....$20.00
Cover.....$2.00 extra

Radio Demands and Deserves the Best

Eliminate the Noise Nuisance

Much of the "crackling" and "frying" blamed to "static" is caused directly by second-hand automobile starting batteries, automobile-type thin-plate, thin-separator, "Radio" "A" Batteries, and defective or partly-discharged Dry "B" Batteries or flashlight cells.

Steady, dependable Voltage is given by USL RADIO "A" and "B" Batteries designed for and made only for Radio Service by a world's leader in Storage Battery Manufacture.

"B" Batteries—One Size Only

24 Volts—2 Ampere-hours

Case—Hard Rubber
Covers—Hard Rubber
Plates—Positive 7/32"
Negative 7/32"
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Terminals—Brass
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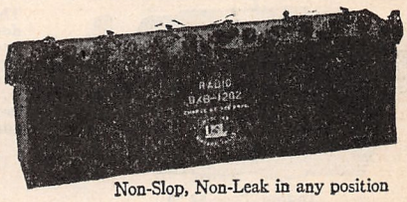

Non-Slop, Non-Leak in any position

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$11.00

Guaranteed Under the Standard USL Service Policy

Also USL Radio "A" Batteries

(IN WOOD CASES)

Mahogany or Mission-Oak Finish

PRICE LIST

DXA 303X-24-30 Amp. Hrs. $11.50
" 305X-65-75 " " 15.00
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(In Canada—20% Additional.)

118 Central Distributing Points
5000 USL Battery Stations and Dealers Everywhere

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Factories:

Niagara Falls, N. Y. Niagara Falls, Canada Oakland, Cal.

Amplification Economy—

Compare for yourself:—

Two stages with
2 popular $5. transformers
—Total amplification, 36.

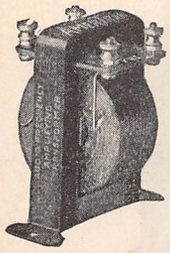
Equipment cost:—

2 transformers	@ $5.00	$10.00
2 tubes	@ 6.50	13.00
2 sockets	@ 1.00	2.00
2 rheostats	@ 1.50	3.00
	Total	$28.00

One Stage with
1 *AMERTRAN*
—Total amplification, 38.6

Equipment cost:—

1 *AMERTRAN*	$7.00
1 tube	6.50
1 socket	1.00
1 rheostat	1.50
Total	$16.00



And remember:—
**the more stages, the more battery drain;
the more tubes, the more tube noises.**

The AMERTRAN

secures its tremendous amplification absolutely without distortion on the part of the transformer

Price $7
Ask your Electrical Dealer; or sent carriage charges collect (wt. 1 lb.)

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Designers and builders of radio transformers for over 20 years
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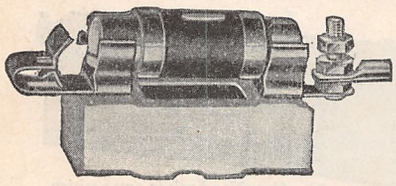
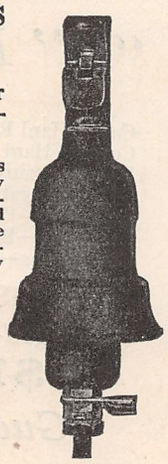
Posted Radio users now take the precaution to protect their outfits by installing the Brach Vacuum Lightning Arrester—the one specified by experienced engineers.



Indoor Type $2.50

The Brach Arrester has demonstrated its superiority and dependability in the service of great railroad and telegraph companies and the U. S. Army by faithful performance throughout many years.

Listed by the Underwriters' Laboratories
Sold by Leading Radio and Electrical Dealers



Outdoor Type $3

L. S. BRACH MFG. CO., Newark, N. J.
16 Years Specialists in Lightning Protective Apparatus
Also Makers of Solderall—Best for Soldering Radio Connections
COAST REPRESENTATIVES—Pacific States Elec. Co., San Francisco, Los Angeles, Oakland, Seattle, Portland, Spokane

RADIO PARTS

We are specialists in

Bakelite Moulding

Send Us Your Drawing or Sample

PROMPT Deliveries

THE RIDGELY TRIMMER CO.
Springfield, Ohio, U. S. A.

MORSCAN

Wireless Supplies and Equipment at Wholesale

MORSCAN RADIO CO.
196 Market Street, Newark, N. J.

tests with the object of endeavoring to ascertain how far his speech and C. W. could be heard. He made arrangements with Mr. Tuson, the operator of the *S. S. Ulimaroa*, to listen in while proceeding from Sydney to Auckland, New Zealand. Mr. Tuson's report discloses that he could read the C. W. at the wharf at Auckland (strength four) and heard snatches of speech (strength two). The distance of Aukland from Sydney is 1,400 miles. One of the New Zealand land stations also confirmed Mr. Tuson's reports. This reception was with a single valve.

A short time ago Mr. Maclurcan received a telegram from Mr. Dixon on the *S. S. Montoro* from Thursday Island requesting him to transmit. Accordingly signals were sent and a telegram in return was received stating that C. W. signals were heard at Darwin, 2,100 miles from Sydney. Mr. Dixon was using one valve and standard ship's equipment.

It should be noted that Darwin is 2,100 miles overland from Sydney, which makes the test all the more remarkable. The power used in this test was very carefully measured and found to be 8.25 watts.

From the foregoing remarks we might begin to peep into the future when we will talk to our friends in distant lands with no more trouble than pushing a button. In fact when we consider that signals have been heard over two thousand miles with the expenditure of only nine watts of current, one might be forgiven for forecasting the time when we will transmit our thoughts one to another at will.

The results of Mr. Maclurcan's latest test have been received by telegram. Mr. Hull at Melbourne heard Mr. Maclurcan transmitting specially arranged code signals in broad daylight at noon, September 10. Only one transmitting bulb was used and the input power was 3.8 watts.

A DX Amateur, Concert and Commercial Receiver

(*Continued from page* 1081)

operating on a small band above and around 200 meters would all come in on one small section of the dial; this makes tuning very sharp and difficult, while with a parallel connection practically the whole dial is used to cover the same range.

Variometer windings in series wave range 180 to 550 meters.

Variometer windings in parallel wave range 150 to 290 meters.

The switch in natural position, upright, brings the variometer windings back to series connection and this covers a wave band from 180 to 550 meters. It is in this position that the phone stations are best received.

The switch in position to the right throws the small fixed condenser across secondary and grid variometer. The fixed condenser on the plate variometer is mounted edgewise on the plates 1"x5" separated by a very thin mica

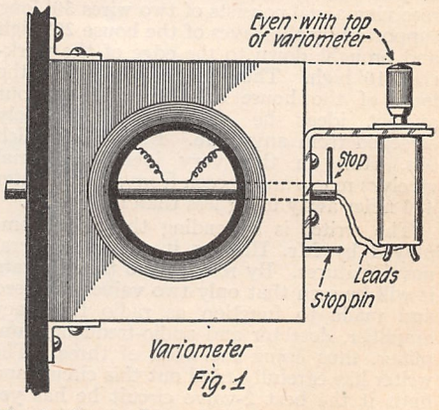


Fig. 1

Showing how anti-capacity switches are mounted on rear of variometers with small brackets. Mount out far enough to clear leads and stop pin when rotor turns.

DICTOGRAPH *Radio* HEADSET

Was $12.00 NOW

Why This Sensational Reduction in Price?

A sweeping cut of $4.00 in price of the Dictograph Radio Head Set! The tremendous endorsement of radio enthusiasts has made possible this sensational reduction. To meet the demand, production has been planned on a new, gigantic scale. Great manufacturing economies establish the new price—only $8.00 complete with 5-foot cord.

A wonderful bargain! And above all, a wonderful **head set**—the world's standard of supreme quality for super-sensitive and accurate sound-transmission.

The same quality, the same guarantee, the same supreme Dictograph head set in every respect but the price. Type R-1, 3,000 ohms, for all types of receiving sets.

The Standard of the World

DICTOGRAPH Radio LOUD SPEAKER

THE PERFECT LOUD SPEAKER FOR THE HOME

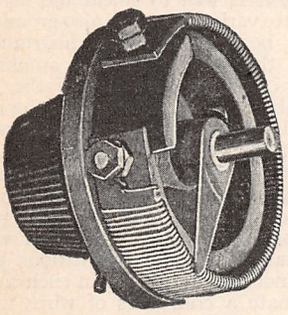
Public demand has made possible the Dictograph Loud Speaker at the low price of only $20.00, complete with 5-foot flexible cord. A handsome instrument that reproduces every sound in crystal-clear, natural tones, full volume, and free from distortion or noise. Ask for demonstration at reliable radio dealers. Get world-famous DICTOGRAPH quality and still save money.

***DEALERS:** Order through your jobber or write direct for names of authorized distributors.*

Note: Plans are now under way for the production of the new 4,000 ohms Dictograph SUPER-TONE Head Set, the most perfect radio head set that can be made. For the most delicate work, the most exacting requirements. A new standard of super-sensitiveness! List Price, $12.00.

DICTOGRAPH PRODUCTS CORPORATION

220 WEST 42nd ST. (*Branches in all principal cities*) NEW YORK, N. Y.



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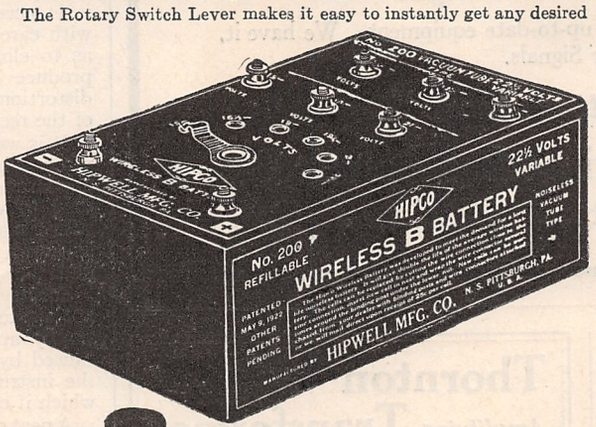
SEE THAT SWITCH

No. 200-The New Improved Hipco Wireless B Battery

The Rotary Switch Lever makes it easy to instantly get any desired voltage. No resistance to overcome, therefore, no loss of energy.

It is also Refillable and Variable same as other styles of Hipco B Batteries and is especially designed for Vacuum tube work on plate circuits and is guaranteed to be perfectly noiseless.



No. 200-22½	Volts,	Price	$3.50
No. 100-22½	Volts,	"	3.00
No. 140-22½	Volts,	"	2.00
No. 245-45	Volts,	"	4.00

The Hipco Rheostat is especially designed for filament control of vacuum tubes. It operates on 4 to 6 volts. The resistance is made of a non-corrosive alloy and can be very readily renewed.

Made with several styles of knobs to match various dials.

List Price, **$1.00** each.

Phone Condensers .001 MFD. at	35c
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Grid Condensers .00025 MFD. at	35c
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BUY A HIPCO MULTIPHONE

Price $5.00 Complete With Four Sets of Head Phones

Let your friends and family listen in—reproduction 100% perfect. No trouble—nothing to get out of order.

ROTARY SWITCH LEVERS

With same knob as illustrated

No. 1-1¼ Radius
List Price **50c** ea.

No. 2-1½ Radius
List Price **55c** ea.

No. 3-1 Radius
List Price **50c** ea.

We also manufacture same with knob to match Rheostat illustrated.

REPUTATION
IS BUILT ON QUALITY

BERWICK
SUPREME
HEAD-SETS

Show Sound Mechanical and Electrical Construction,
Good Materials and Painstaking Craftsmanship.

Guaranteed 100% for Efficiency and Quality

Aluminum Cups—2200 Ohms—Lightweight—Comfortable.

Write for circular H and very attractive proposition.

Triangle Electro Trading Co., Inc.
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You May Listen
To distant broadcasting stations thru local interference if you use

RADIOVOX

PACIFIC COAST BROADCAST heard in Cincinnati on antenna 30 feet long, 35 feet high.

You want the most up-to-date equipment. We have it, Non-Infringing—Clearer Signals.

"Better Radio"

Scientific Engineering Association
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Quantity production enables us to supply the following radio parts at the lowest possible prices:

VARIOMETERS
VARIO-COUPLERS
VARIABLE CONDENSERS
SOCKETS
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PHONE JACKS
DIALS
PANEL SWITCHES
BINDING POSTS
SWITCH POINTS

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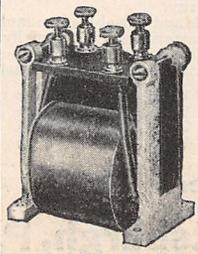
THE SYPHER MANUFACTURING COMPANY
Dept. R **Toledo, Ohio**

Thornton *Audio Frequency* *Amplifying* **Transformer**



"The Transformer Supreme"

We still have territories open for Jobbers
Write for particulars

Thornton Transformer Co., Inc.
30 Church St., New York

washer about the thickness of a piece of tissue paper to give the high capacity desired. The condensers shunted this way enable the grid and plate circuits to tune from 550 to 1,400 meters.

A variable condenser is shunted externally across the primary, which is necessary for waves above 750 meters.

Certainly a compact way to double the range of a regenerative receiver with such a simple arrangement and really increases the efficiency of the set, especially on the desired amateur waves because the variometers are working at their maximum efficiency over this certain wave band when coils are in parallel. The resistance of the circuit is reduced. The advantage, however, is purely a practical one, giving much more selective tuning between points on the variometer dial and greater selective control, thereby giving louder signals.

Amplifier

If the signal from the detector is of good quality and loud enough to be heard distinctly in the head-receivers, the chief problem is maintenance of the quality, as it is comparatively simple to obtain the necessary amplification.

Distortion is usually caused by poorly made or constructed amplifying transformers, operation of the amplifier on the tube at the wrong point of its characteristic, or by overloading the tube to the point of saturation.

Two to three amplifier tubes work best in cascade without overloading them. If desiring very strong signals, a small power tube used in the third stage with 250 to 300 volts on the plate, a grid voltage of about 15 to 20 volts negative, which will hold the plate current down to normal, operates the tube upon a straight portion of its characteristic if necessary. This is advised only if using a loud speaker of the Magnavox type.

Using a 2-stage amplifier with a loud speaker, more than sufficient amplification for a living room should be secured.

To further reduce distortion, tube noises, strays, etc., it is well to shield the coupler, grid and plate variometers and also ground the shafts and bearings of these instruments. Grounding the frames of the amplifying transformers and negative side of the "A" battery is also advised, especially if the set is to be used for DX amateur work where quiet operation is desired.

In order to produce a combination receiver and amplifier to receive over this band of waves efficiently, operate a loud speaker and give pleasing results on DX amateur work, it is necessary to choose the various parts with care, mount instruments in such a way as to eliminate a criss-cross of wires which produce howling and other noises causing distortion and lessening the whole efficiency of the receiver.

It is well to use Empire tubing throughout when wiring. Black makes a very neat appearance. No. 14 hard drawn copper is easy to work with and very neat bus bar wiring may be made. By placing instruments as shown very short and direct leads can be had.

Solder all joints and connections but do not use too much solder as this makes a very sloppy appearance. Much trouble may be caused by using an acid flux, which will ruin the instruments and corrode the wires with which it comes in contact.

A neat cabinet adds much to the appearance of the set; these can be secured from many of the radio stores or concerns which make a specialty of this work.

Buy standard parts, construct and assemble them at home with a little care and workmanship and have the pleasure of seeing your own handiwork in operation.

Photograph No. 3 shows the complete receiver in the cabinet with just the ordinary regenerative receiver controls, leaving the panel plain.

The cabinet is made of 5-ply ½" veneered quartered oak. The cover is in two sections,

Something New! Convert Your Phonograph into a Radio Receiver!

Make Yourself and Family a Real Christmas Present

What could give greater pleasure in the months to come than to "listen in" to the music and entertainment with which the air is filled?

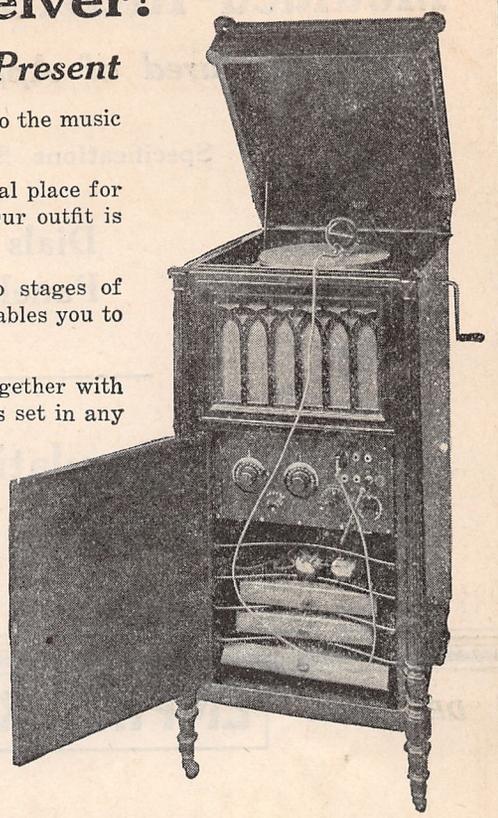
Build a radio receiver to fit into your phonograph cabinet, which is the logical place for same, where it is most accessible and yet out of sight when not in use. Our outfit is self contained, however, and can be operated from any place desired.

The illustration shows a removable receiving unit with detector and two stages of amplification installed in a cabinet phonograph of standard make, which enables you to receive broadcasting within a range of from one to two thousand miles.

We have prepared a set of plans with blue print of assembly and wiring together with illustrated work sheet covering detail of the building and installation of this set in any cabinet phonograph without injury to either its appearance or operation.

Our plans are very simple so that anyone who can use a drill, saw, and screw-driver, can easily build and install this Radio receiver at an expense of not over fifty dollars. It is very easy to tune, and yet will produce results equal to and in many cases superior to ready-made sets costing several times this amount of money. It works nicely, using the lighting circuit for an antenna.

Plans and instruction sheets will be sent to any address in the United States upon receipt of one dollar.



NOXALL RADIO COMPANY
SYRACUSE **NEW YORK**

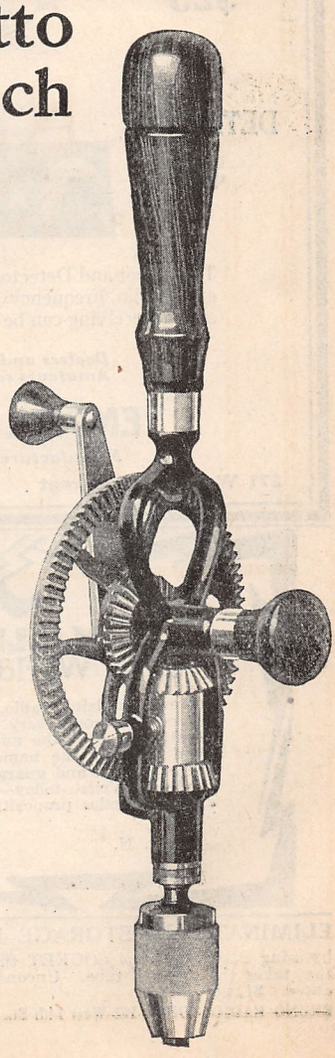
"'Clean and fast' is the motto of this drill," says Mr. Punch

You radio enthusiasts who make and assemble your own sets want and need good tools. That's why you'll appreciate this Goodell-Pratt Hand Drill. It bores cleanly and easily through wood and metal. You can make your holes for wiring and for any other purpose neatly, quickly, and accurately.

This Hand Drill is only one of the Goodell-Pratt Tools you will find especially useful for radio work. Some of the others are automatic drills, bench drills, plain screw drivers, ratchet screw drivers, tap holders, and bench lathes. They are all tools you will like to handle—tools that will last a long time and endure the hardest usage. Ask the man who has used them what he thinks.

Your hardware dealer has this hand drill or can get it for you. Ask him about Goodell-Pratt Tools or write us for our free catalog illustrating and describing our complete line of 1500 Good Tools.

GOODELL-PRATT COMPANY
Toolsmiths
Greenfield, Mass., U. S. A.



Hand Drill No. 5½
Price, $5.50

Hand Drill No. 5½ has the extra advantage of two different speeds that enable it to be used equally well on all classes of materials. Takes all sizes of round-shank drills up to ⅜ inch. No play in spindle. Ballbearings.

GOODELL-PRATT
1500 GOOD TOOLS

Moulded-RADIO-Accessories

Manufactured of Approved Material

Specifications Solicited

Knobs	Dials	Rotors
Couplers	Panels	Stators

International Insulating Corporation

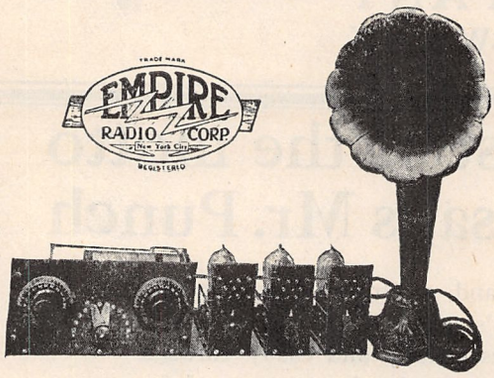
Radio Dept.
25 West 45th St.
New York City

Factory
Springfield,
Mass.

DECEMBER **EMPIRE RADIO** *BULLETIN*

TUNER
$25

DETECTOR
$6



R. F.
AMPLIFIER
$14

A. F.
AMPLIFIER
$14

The Tuner and Detector make a complete Radio Receiving set. The Audio and Radio Frequency units may be added, at will, to enlarge the outfit, so that receiving can be accomplished without the use of an out-door aerial.

Dealers and jobbers write for attractive proposition
Amateurs send 10c for our new and complete catalog

EMPIRE RADIO CORPORATION

Manufacturers and Distributors of Radio Apparatus

271 West 125th Street New York City

MPM

MILLION POINT MINERAL

The World's Greatest Radio Crystal

is revolutionizing radio. It is supersensitive and is the only crystal which reproduces from every point on its surface. Allows maximum range and greatly increases the audibility.

Send 50c and the name of your Radio Dealer for two M. P. M. crystals, concert tested and guaranteed.

Dealers: Write—today—for complete information about M. P. M. and our attractive sales proposition.

M. P. M. SALES COMPANY
Dept. N. 247 So. Central, Los Angeles, Cal.

ELIMINATE the STORAGE BATTERY

by using BRU No. No. 4 SOCKET the only socket that takes the dry cell tube. Unconditional guarantee. $1, postpaid.

BRUNO RADIO CORP., 152 West 14th St., New York City

Buy From Reputable Manufacturers

Our 3 factories are devoted to the manufacture of reliable, guaranteed complete radio receiving sets and parts.

FREED EISEMANN RADIO CORPORATION
255 FOURTH AVENUE NEW YORK, N. Y.

one opening over the regenerative side, to change the series-parallel switches, the other opening over the amplifier. Covers set flush with the top of the cabinet and are raised by lifting small nickel insert rings. The hinges are nickel-plated piano hinges, which run the length of each cover, making a novel appearance with much rigidness to the cover and finished over in Flemish oak.

By purchasing standard parts, constructing and assembling the set at home, about one-half the price of the set is saved. With a little care and good workmanship a set which will operate as efficiently as the best on the market can be assembled with the satisfaction of seeing your own handiwork in operation.

WAVE-LENGTH RANGES

GRID SWITCH

To Left short-wave coils parallel	150 to 290	meters
Intermediate coils series	180 to 550	meters
Right long-wave coils series cond. shunt	400 to 1,400	meters

PLATE SWITCH

To Left short-wave coils parallel	150 to 290	meters
Intermediate coils series	180 to 550	meters
Right long-wave coils series cond. shunt	400 to 1,400	meters

PRIMARY

Taps 1 units 5	Amateur waves.	
Taps 3 units 5	Phone broadcasts	360 meters
Taps 4 units 5		450 meters
Taps 6 units 5	Commercial	600 meters
Taps 7 units 5	Commercial Bearings	800 meters
Taps 7 units 7	Navy	975 meters

SHORT WAVE

Grid.	Apprx. Wave
60	190 meters
80	200 meters
100	225 meters

INTERMEDIATE

Grid.	Appx. Wave
70	200 meters
60–80	360 meters
180	600 meters

LONG WAVE

Grid.	Appx. Wave
40– 45	600 meters
75– 80	800 meters
90–110	975 meters
135–140	1,200 meters
160–180	1,400 meters

LIST OF MATERIALS

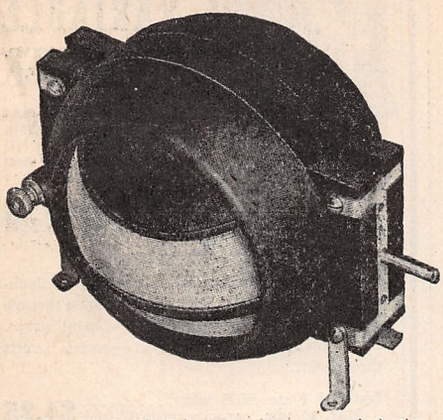
1 Bakelite panel 7"x30"x$\frac{3}{16}$"	$ 4.50
1 Baldwin variocoupler	8.00
2 Baldwin variometers @ $7 each	14.00
1 small dial for coupler	1.00
2 large dials for variometers, Paragon, $1.75 each	3.50
4 Fada receiving rheostats @ $1 each	4.00
2 Fada inductance switches with contacts @ $.75 each	1.50
4 general radio sockets @ $1.50 each	6.00
4 Federal Tel. & Tel. double circuit jacks @ $1 each	4.00
3 Federal Tel. & Tel. amplifying transformers @ $7 each	21.00
1 small fixed condenser	.70
1 Dubilier Grid condenser .00025 mfd	.80
1 Marconi Grid leak	.50
8 binding posts, black hard rubber, @ $.10 each	.80
2 Federal No. 1424 anti-capacity switches, @ $2.80 each	5.60
5 lengths black Marconi tubing, @ $.20 per length	1.00
Material for Grid and plate loading condenser, $1 each	2.00
Bakelite shelf for tubes and transformers	1.00
Cost of nickel plating parts	.60
Cost of machine bolts, screws, nuts, washers and miscellaneous hardware	1.50
"Cabinet" wood ½" veneered quartered oak, 5-ply	4.50
2 nickel plated hinges, each 15" long, $.24 each	.48
2 nickel plated insert rings, $.25 each	.50
4 key slip side catches	.18
Sheet copper for shields	.15
Wire, solder and miscellaneous material used and construction.	

An Efficient High Frequency Buzzer

(*Continued from page* 1085)

different voltages are included in the unit. A high-frequency buzzer is mounted upon a small formica panel also carrying a 4-point switch and terminals. A very small wooden box supports the panel and contains two 3-volt batteries and a small transformer, the latter being used for bridge measurements. Two extreme values of sound intensity are

MAKE THIS A REAL RADIO CHRISTMAS



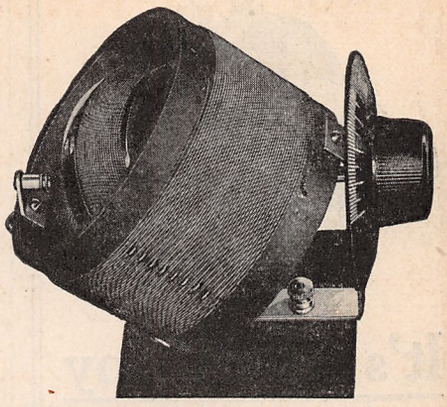
Moulded Variometer $5.50

BY USING OUR PRODUCTS IN ASSEMBLING YOUR SETS. WE ASSURE YOU OF THE BEST APPARATUS THAT CAN BE PURCHASED IN EFFICIENCY DESIGN, FINISH AND (*PRICE*)

Don't pass up this page without studying the new and unusal features of our instruments.

Our Variometers and Couplers are instruments of efficiency, beautiful finish and first-class construction. *They are moulded of hard rubber.* This eliminates all possibilities of warping, shrinking, or "leaks." They are designed for low dielectric losses and maximum range of inductance. In construction and operation they are mechanically and electrically perfect.

SPECIAL OFFER
1 COUPLER
2 VARIOMETERS
$15.25



Moulded Coupler $5.00

VARIOMETER. The stators and rotor are *moulded of hard rubber* and are highly polished. Green double silk-covered wire used. All parts nickel plated. *Clearance between rotor and stator is .0005 with a + or − of .0002 either way.* Large dimensions permit the use of low resistance wire. No paraffin or shellac used in wiring. Shaft 3/16" or ¼". Wave length, 150 to 650 meters.

COUPLER. 180°. Rotor *moulded of hard rubber*, all windings of green double silk-covered wire. Primary tube made of high di-electrical composition 3/16" thick, mounted at 45° angle, adapted for base and panel mounting. Shaft 3/16" or ¼" nickel plated fittings. Primary wound with 50 turns of wire tapped every fifth turn. Effective tuning range, 150 to 650 meters.

LOOK AT THESE BARGAINS

Pittsfield Condensers—			
3 Plate Vernier Condenser	$2.80		
11 Plate Variable Condenser, assembled	3.20		
23 Plate Variable Condenser, assembled	3.60		
43 Plate Variable Condenser, assembled	4.00		
American Electric Head Phones, 3200 ohms	9.50		
"Micon" Tested Mica Condensers, .00025	.35		
.0005	.35	.001	.40
.0025	.50	.005	.75
.002	.40		
All-American Radio Frequency Transformer	4.50		

All American Audio Frequency Amplifying Transformers, ratio 3 to 1, mounted	$4.25
Audio Frequency Amplifying Transformers, ratio 10 to 1, mounted	4.50
Howard Rheostats, Moulded Base	1.10
Howard Vernier Rheostats	1.50
Howard Potentiometers	1.50
3" Moulded Dials, 3/16" or ¼" hole, polished	.75
Pittsfield VT Socket, each	.75
Howard Bridging Condensers	.60
Howard Contact Points with Nuts, each	.01½
Howard Contact Stops, with Nuts, each	.01½

Binding Posts, Moulded Knob, each	.10
Hole Type Binding Posts, Nickel Plated	.03
Black Fibre Panels, with smooth sawed edges— ¼" thick	.01½ per sq. in.
Switch Levers, 1", 1⅜", 1½"	.50
Previously Advertised Variometers	4.50
Previously Advertised Couplers	3.75
Special offer, 2 Variometers, 1 Coupler	12.00
40 Name Plate Transfers for Panels	.35
Valley Battery Charger for 6 or 12 V. Battery	18.00

We pay transportation charges. If you are not satisfied in every way with our equipment, return it at once and we will refund the purchase price

DEALERS—Write for our proposition

RADIO INSTRUMENT AND PANEL CO. 26 N. DESPLAINES STREET CHICAGO, ILL.

The RADIOGEM

(Patents Pending)

$1 **Receiving Set—The Simplest Radio Outfit Made—Yet as Practical as the Most Expensive!** **$1**

You need know absolutely nothing about wireless to operate and enjoy the RADIOGEM. It is so sturdy, so simply constructed that it is small wonder radio *engineers who have tested* it have pronounced the RADIOGEM a brilliant achievement. The RADIOGEM is a crystal radio receiving set for everyone at a price anyone can afford.

Why The RADIOGEM Can Be Sold For Only $1

Here's the secret: The RADIOGEM Construction eliminates all unnecessary trimmings, cabinets and the like, which do not play any part in the operation of a set. You receive the RADIOGEM unassembled, together with a clearly written instruction book, which shows you how to quickly and easily construct the set, using only your hands and a scissor. The outfit comprises all the necessary wire, contact points, detector mineral, tube on which to wind the coil, etc., etc. The instruction book explains simply and completely the principles of radio and its graphic illustrations make the assembling of the RADIOGEM real fun. Remember the RADIOGEM is a proven, practical radio receiving set and will do anything the most expensive crystal set will do.

The RADIOGEM is the Prize Winner of the Age

Out of hundreds of radio models submitted recently in a great nation-wide contest, radio engineers, the judges, unanimously chose the RADIOGEM as the winner—the simplest radio-receiving set made! And the RADIOGEM costs you nothing to operate; no form of local electricity is required.

DEALERS The RADIOGEM is the wonder item of the radio age. It is storming the country, for the RADIOGEM'S price is so low everyone is able to buy one. Write immediately for full particulars before that shop across the street beats you to it.

Receives up to 20 Miles

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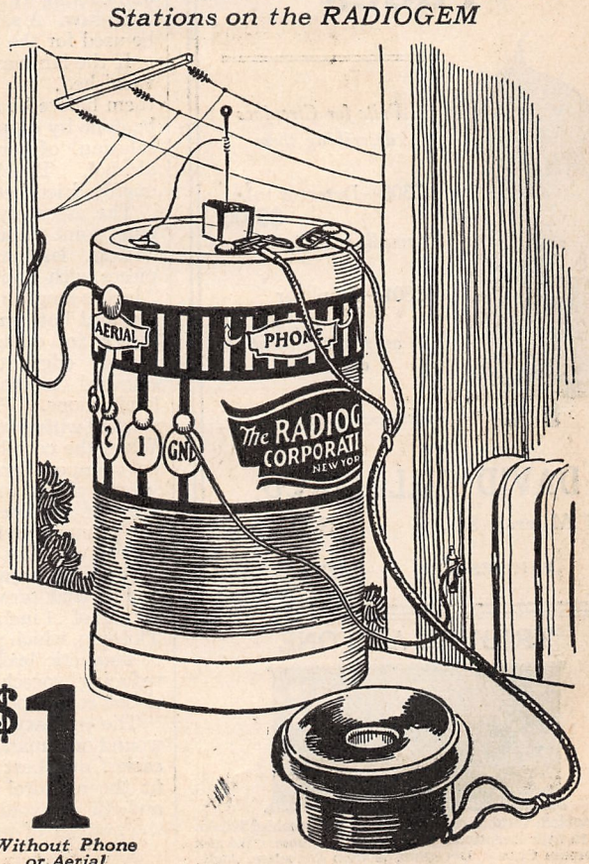
The Ideal Xmas Gift

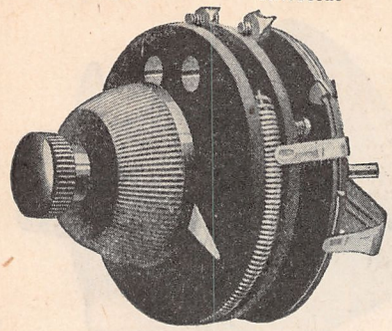
Hear the programs of the Broadcasting Stations on the RADIOGEM



$1 *Without Phone or Aerial*

CRL

Vernier Rheostat



It's A Real Joy

to be able to tune your set to just the right wave-length.
C R L Vernier Rheostats provide for extremely accurate control of the filament current over its entire range.
You'll like the noiseless, smooth action that the C R L design insures. Each turn of the resistor is anchored permanently in its correct position.

For best results, insist on C R L Rheostats and Potentiometers of both the plain and vernier types.

CENTRAL RADIO LABORATORIES
305 16th Street
Milwaukee Wisconsin

Cunningham Tubes

Write for Circulars describing them

C300—Detector tube **$5.00**
amplifies as it detects

C301—Amplifier **$6.50**
amplifies without distortion

DAVID KILLOCH CO.
57 Murray St., New York
WHOLESALE RETAIL

TRIBUNE AIRFONE

Unassembled, without cabinet, $12.63. Assembled $25.00. Brings in with exceptional clearness and volume. We also manufacture Crystal Detectors, Audion Detectors. Audio and Radio Amplifiers. Catalog on request.
TRIBUNE AIRFONE CO., Dept., O, Owego, N. Y.

helpful in bridge work, so that three turns only may be used in a primary by placing the switch arm on P–2, Fig. 3, or the total of 10 turns for maximum primary strength on P–1. The transformer is 1″ long and has a ¾″ diameter made by winding 10 turns of No. 26 enamel on a core of fine iron wires. A primary tap is taken from the third turn. The secondary is 500 turns of No. 4 silk-covered copper wire. After windings are in place the core wires are bent around the outside of the coil, completely enclosing it. Fig. 2 shows the position in the case. Two 3-volt flashlight batteries obtainable at Woolworth stores are connected as shown in Fig. 3, and stored in the small box of the unit, Fig. 2. Two flexible 10″ leads are employed for connecting to the circuit.

After completion, the unit is carefully measured to determine its leads and internal capacity for different settings. These values are marked on the bottom and are always considered when the exciter is used. Since this little device has been assembled, its capacity has never changed. That of makeshift arrangements could never be known without extensive measurements for every hook-up. Such a device, although simple, has been of great value and finds constant use. I am sure it could also be of great use to others engaged in this work.

Construction of a Modulation Transformer

(*Continued from page* 1085)

U-shaped pieces 1 and ½ inches long (inside measurement), 16 pieces will be required, and the same number of T-shaped pieces 2 inches long. Of each of the other T and U-shaped pieces, 17 will be required.

The transformer iron used should be the best grade silicon transformer steel, in laminations of No. 29 gauge or approximately .014 inch thick. The iron should be purchased in laminations measuring 2 by 3 inches, and the T and U-shaped pieces can be cut from these by clamping a number of them together and cutting away the surplus material with a hack-saw. A saw with very fine teeth should be used for the work.

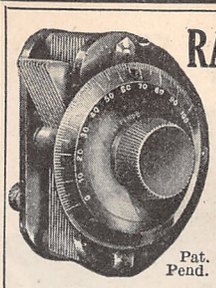
If the laminations when purchased are not varnished, the constructor should varnish them before he assembles the core. This can be done by dipping each lamination in a thin solution of orange shellac in denatured alcohol. The laminations should be thoroughly dried before assembling the core.

The assembly of the core is very simple. One point should be noted: The top and bottom laminations should be U-shaped pieces with 1 inch legs, and T-shaped pieces 2 inches long. In Fig. 1 the arrangment of the top and bottom laminations is shown. The reason for doing this is obvious; when the shorter edges of the completed core are clamped together there will be no loose laminations. The remainder of the core is stacked with short and long pieces alternately. When the core has been completed it should be clamped firmly together and bound in several places with stout cord. The two sections of the core can then be separated so the primary and secondary windings can be slipped over the central leg.

It should be noted, by referring to Figs. 1 and 2, that provision has been made for an air gap of .1 inch in the central leg of the core. This gap, which provides for a certain amount of magnetic leakage, is of material value in reducing speech distortion so common in closed core type modulation transformers.

The primary and secondary windings are wound on a mandrel .7 inch in diameter. The easiest and best way to wind the coils is to fit the mandrel to an ordinary breast drill and use a revolution counter to check up on the number of turns.

The mandrel should first be wound with several turns of oiled paper and over this about four turns of heavy bond paper is



RADIO STORES VARIABLE CONDENSER

Pat. Pend.

Used by De Forest and other leading manufacturers in latest sets has been awarded

Radio News Certificate of Merit
(No. 22)

Counter weight under dial. Brass studs, aluminum plates, die cast. Shaft in true center through brass bushings. Binding post on metal straps. No insulating material tapped — metal inserts throughout.

List—23 Plate .0005 mfd. **$4.25**
Max. to min. capacity, ratio 12 to 1.

List—43 Plate .001 mfd. **$4.75**
Max. to min. capacity, ratio 22 to 1.

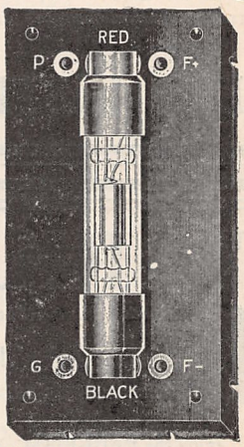
Ask Your Dealer

If he does not carry Radio stores products, send his name with remittance and we will ship direct to you —postpaid.

RADIO STORES CORP.
222 W. 34th Street, New York

RAC-AUDION

AUDION $5.00
5 TIMES THE AMPLIFICATION OF THE ORDINARY TUBE



RECEPTACLE $1.00
WRITE FOR INFORMATION AND DIAGRAM USING RAC CHOKE COILS

4 V-Fil 0.8 Ampere 60 Plate
New Jersey Radio Equip. & Install. Co.
120 BIDWELL AVE. JERSEY CITY, N.J.

Don't Wear a Truss

BE COMFORTABLE—

Wear the Brooks Appliance, the modern scientific invention which gives rupture sufferers immediate relief. It has no obnoxious springs or pads. Automatic Air Cushions bind and draw together the broken parts. No salves or plasters. Durable. Cheap. Sent on trial to prove its worth. Never on sale in stores, as every Appliance is made to order, the proper size and shape of Air Cushion depending on the nature of each case. Beware of imitations. Look for trade-mark bearing portrait and signature of C. E. Brooks which appears on every Appliance. None other genuine.

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No selling or subscription work required.
You can make your "SPARE" hours "BUY" you a new, genuine, guaranteed 43 plate Murdock Variable Condenser —merely collecting a CERTAIN *worn-out* part of Ford Automobiles which garagemen will gladly give you free. Ship these to us and the new genuine Murdock Condenser is YOURS. Write for amazing particulars. Act quick.

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wound and well shellacked. This should then be baked until dry. Upon this the primary is wound, consisting of 200 turns of No. 30 enameled copper wire wound in three layers. Each layer should be separated from the next with a turn of oiled paper, and over the last layer, six turns of the oiled paper should be placed. Directly over this is wound the secondary, which consists of from 6,000 to 8,000 turns of No. 40 enameled copper wire wound about 200 turns to a layer, each layer separated from the adjacent one by a turn of oiled paper. The final layer is wound with several turns of oiled paper and completed with four wraps of well-shellacked bond. The completed windings should then be impregnated by immersion in hot paraffin for two hours.

Leads 3 inches long, consisting of three No. 30 bare copper wires twisted together, should be soldered to the ends of the primary and secondary windings, care being taken to secure them to the coil in such a manner that they cannot be broken off.

The two brackets which clamp the core together and serve to support the transformer are cut from sheet brass or aluminum 3/32 inch thick. The template and dimensions are given in Detail B, Fig. 2, for the brackets and the manner in which the brackets are bent is shown in the illustrations of the completed transformer in Fig. 1. All holes are 3/16 inch, although it may be necessary to ream out the holes for the binding posts, depending upon the size of screw they are fitted with.

The assembly of the transformer is clearly shown in Fig. 1. The coil is placed over that portion of the T-shaped section of the core, which forms the central leg of the completely assembled core, and the other section fitted in place. The edges of the core are then slipped into the brackets and the bolts which clamp the brackets to the core tightened until the core is held firmly in place. If the brackets have not been bent exactly to the dimensions given, it may be necessary to "shim" up the edges of the core with thin strips of cardboard until the brackets can be clamped tightly to the core.

The binding posts are mounted with insulating washers on either side of the bracket arm, in order to prevent them from grounding through the brackets. The washers are preferable, although washers cut from heavy fish paper or micarta will answer the purpose just as well.

The leads from the primary and secondary windings are covered with short sections of "spaghetti" and soldered to the binding posts. In soldering all the connections of the transformer it is well to use a non-corrosive soldering paste, and to use as little of it as possible.

When completed, the transformer should be tested for grounds or open circuits. If faults are found, they should be corrected and care taken to prevent their reoccurrence.

The use of the transformer requires but little mention, as this subject has been more or less completely covered in texts and papers treating with this topic and should be familiar subject matter to the reader. The few following notes may, however, be of value.

The primary or microphone circuit should include a battery of from four to eight volts. The correct amount depends a great deal upon the location of the transformer as a modulating device and upon the microphone used with the transformer. High potentials in the primary circuit should be avoided, as they tend to cause deterioration of the microphone granules and are usually a source of speech distortion. The correct voltage of the primary circuit can only be ascertained by trial, but usually it falls within the limits stated above.

If the transformer is to be used in constant current systems of modulation on powers to exceed ten watts, it is recommended that a speech amplifier hook-up be used, for the current carrying capacity of the secondary

Dealers, Read This—

Here's the Evidence!

Atlanta, Ga., **Journal,** dated July 31, 1922, publishes following story proving SUPERIORITY of DELTA GOLD STRIPE RADIO HEADSETS.

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Boy With Home-Made Crystal Set and DELTA Receiver Accomplishes Wonderful Record for Distance

"Last night (July 27) I heard your program after 10 o'clock, but I could not bring you in very well at first. After punching my detector for a half hour I found you, although I had some difficulty in keeping you. I heard the remainder of your program QSA (clear and loud) and I enjoyed your program very much. My outfit is a home-made crystal set with a home-made detector and a coil three inches in diameter wound with 130 turns No. 24 wire, tapped every ten turns with a single turn tickler. **This, with a set of 2200-ohm DELTA phones, makes up my set.** I have two aerials, but the one over which I received you is about 22 feet high and 150 feet long, including lead-in. My ground has a 24-foot wire leading to a well."

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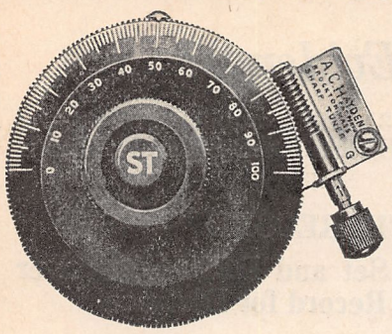

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is limited and with excessive powers the windings may be burnt out.

Where the transformer is inserted some place in the circuit of a single oscillating tube, it will often be found of material value to shunt the secondary with a condenser. Modulation will not be affected, but the output of the set will be increased.

Some Experiment With Low and Underground Antennae

(*Continued from page* 1078)

and a zinc plate buried; one end of the wire was grounded. The receiving set was of the crystal type with a double slide-tuning coil. The wire was laid down in the direction, southwest to east, northeast and it was possible to receive all the signals coming from the west.

The same wire was then buried 5 feet deep and it was found possible to receive in daytime, Cadiz and Madrid. It was noticed that the capacity of the aerial was considerably increased and it was necessary to insert a series condenser in the antenna. When the same wire was laid down on the ground, equipped with small inductances of three turns every 33 feet, it was found possible to receive during the night the time signals from the German station at Norddeich.

A second antenna composed of two wires, each 600 feet long, was erected; one wire was laid on the ground and the other was buried with small inductances cut in every 33 feet. On such an antenna, it was possible to receive the press messages from the Eiffel Tower station with very little static, and when listening on the aerial of the regular station, nothing but a continuous roar was audible in the telephones, preventing any signals being copied.

During the second series of tests carried out during September, 1915, it was noticed that best results were obtained when the aerial was vibrating in half-waves. The transmitting station, in this case, was a ship equipped with a 5-K.W. spark set sending on a 450-meter wave-length, and it was possible to observe the various intensities of signals while the ship moved from north to west. The receiving set was the small crystal receiver described previously, and permitted the reception of the signals from a distance of 300 kilometers when the ship was at the west of the station on a combination of three wires laid on the ground in the directions of east, north and west.

No signals were received on the wire laid in the northern direction while the ship was at the west of the station, and it was noticed that the intensity of signals was considerably increased when the length of the wires was increased from 300 feet to 1,200 feet.

The third series of tests was made by listening to the signals from Bizerteon 1,800-meter wave-length, the station using a power of 18 kilowatts. The 1,200-foot wire previously used but erected three feet above the ground, was still sufficient on this wave-length and even on 2,600 meters, signals from the Eiffel Tower could be tuned. However, when the wires were extended up to 1,800 feet in length, no signals at all were received. This shows that the length of the wire is critical for a certain band of wave-lengths and in case one of these antennae is erected for reception, experiments have to be carried out first to determine the proper length which will give maximum audibility. When the ground is very dry, the directional effect is very marked, and maximum intensity of signals is obtained when the low aerial vibrates in half-waves with variable condensers in each branch for sharp adjustment.

It has been found, also, that some antennae composed of an insulated wire either laid on the ground, buried, or erected above the ground, respond to several wave-lengths, generally three or four, which will not always

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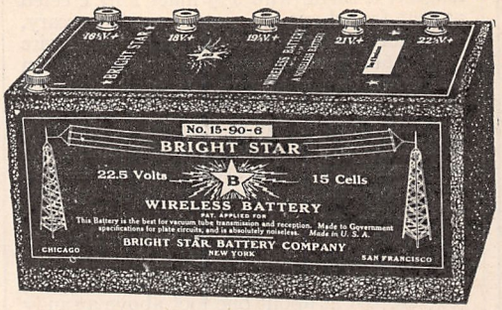

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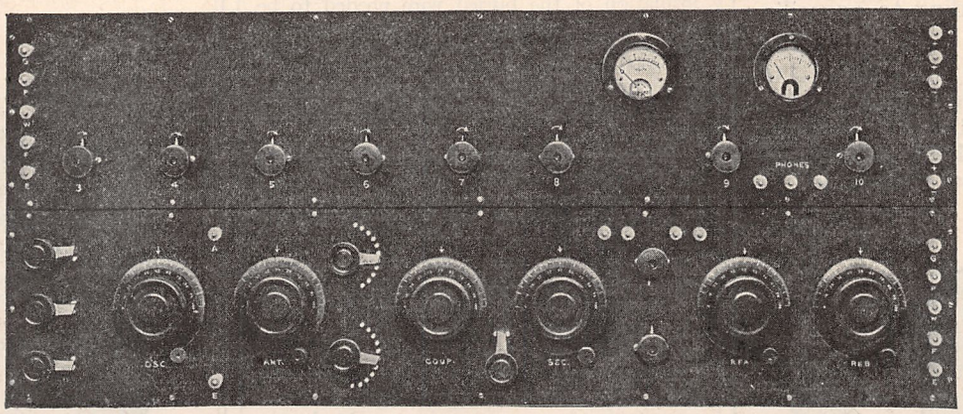

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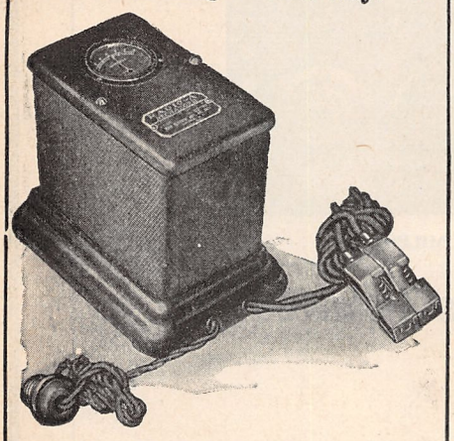

A XMAS GIFT THAT WILL LAST A LIFETIME

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correspond to the harmonics of the fundamental wave-lengths of the aerial. For instance, a wire 1,000 feet long, erected at six feet above the ground, would respond to the following wave-lengths, 330, 580 and 1,820 meters; when the same wire was laid down on the ground, maximum results were found at wave-lengths of 350, 520, 940 and 2,600 meters. This shows the influence of the distance from the ground upon the results. It has been shown by Mr. Roy E. Weagant that for the reception of very long wave-lengths, a single wire 5½ miles long erected at nine feet above the ground was necessary, while for the same wave-length a second wire only 2,665 meters long was necessary when laid down on the ground. It is also possible to vary the range of the aerial by burying a metallic plate to which the end of the wire is connected. If a variable condenser is used, it is possible to get best results on any desired wave-length while statics are almost entirely eliminated.

In order to determine the directional effects of low antennae, Mr. Tissot, a French naval officer, tried to receive signals with a single wire erected at about one foot above a sandy beach, so that the wire was above dry ground at low tide and above water at high tide. The limit cases were then observed and this clearly showed that the directional effects are very marked when the ground below the wire is dry, while it does not exist at all when the wire is directly above the water.

During the tests made in this country, at Washington, D. C., in 1916, it was found that while the directional effect of a buried antenna was very sharp, for spark stations, it was quite absent for continuous wave signals. It was also strange to note that the resonance of the primary circuit seemed to have no importance whatsoever, while the coupling played the most important part in the tuning, and needed a very sharp adjustment.

Some similar tests were carried out at New Orleans in March, 1917, in very damp ground. The wire was laid down and it was found that the proportion of statics picked up by an elevated antenna and the ground antenna, was in the ratio of 1,000 to 1. The insulation of the buried wire needed to be very strong, otherwise the proportion of statics picked up increased. It was possible to receive spark signals on 600 meters on a wire 300 feet long during a thunderstorm which prevented any traffic with an elevated aerial.

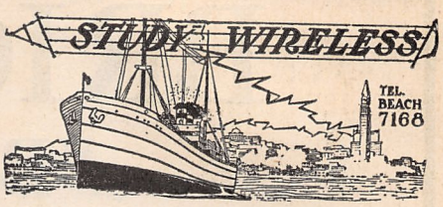
Professor Taylor experimented extensively in the Great Lakes section with buried aerials and he gives the ratio of the wire to the wave-length as being one-eighth the length of the latter.

During further tests it was also found that statics could be entirely eliminated by using as an antenna a well-insulated wire laid down in water. With this system, it was possible to receive trans-Atlantic stations without any amplifier when a wire 3,000 feet long was used. The maximum wave-length does not seem to exist on such a wire, as Dr. Austin proved by his experiments with immersed wires. He was able to tune in at Belmar, Lyons station on 15,000 meters, Carnarvon on 14,000, Nauen on 12,600, Rome on 11,000 and Nantes on 10,000, meters.

When compared to elevated aerials, buried antennae seem to be only advantageous for the elimination of statics, as the following experiments prove.

At Belmar, a single insulated wire was covered with a lead tube and buried. The audibility of signals was medium between that obtained on buried wires in dry ground and immersed wires in salt water. When the lead tube was cut in several points, the intensity of the signals increased, but the statics increased also in the same proportion so that the clearness became inferior to that of a wire in dry ground.

There are numerous experiments to carry on with buried wires and it might prove interesting to try out such antennae for the



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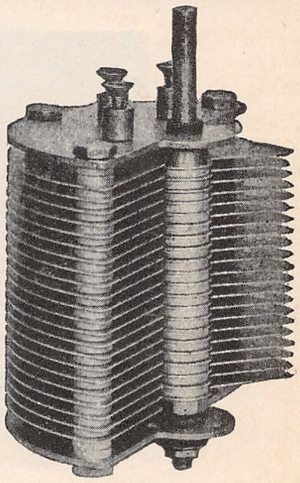

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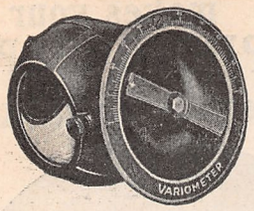

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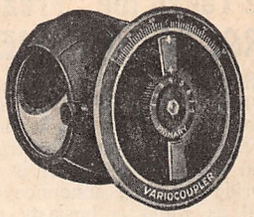

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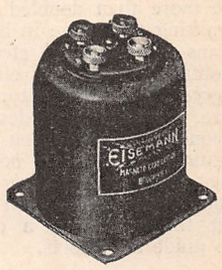

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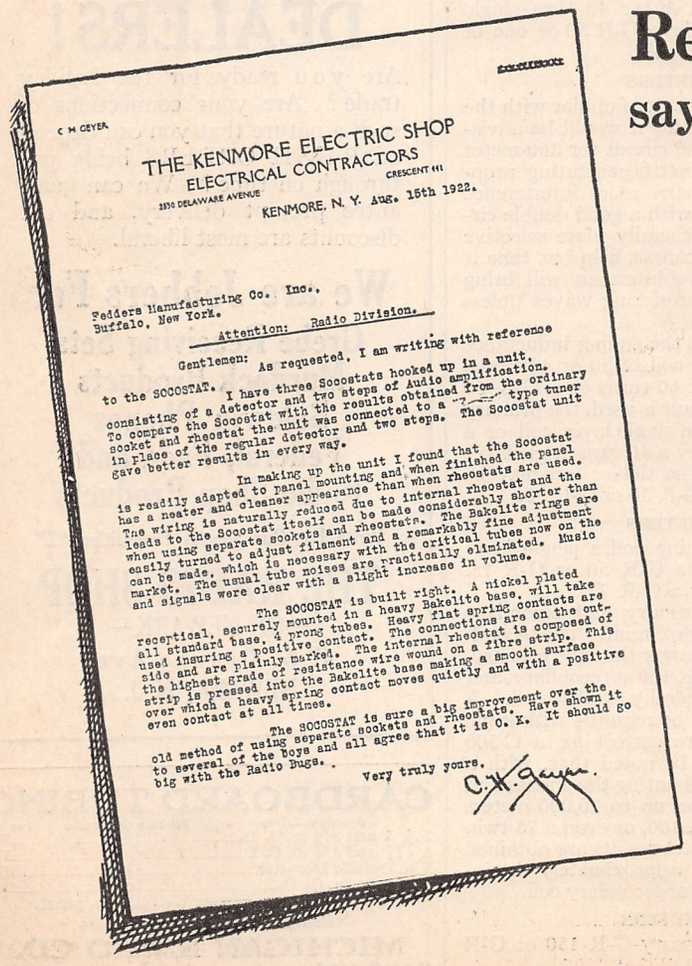

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Attention: Radio Division.

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I have three Socostats hooked up in a unit, consisting of a detector and two steps of audio amplification. To compare the Socostat with the results obtained from the ordinary socket and rheostat the unit was connected to a ——— type tuner in place of the regular detector and two steps. The Socostat unit gave better results in every way.

In making up the unit I found that the Socostat is readily adapted to panel mounting and when finished the panel has a neater and cleaner appearance than when rheostats are used. The wiring is naturally reduced due to internal rheostat and the leads to the Socostat itself can be made considerably shorter than when using separate sockets and rheostats. The Bakelite rings are easily turned to adjust filament and a remarkably fine adjustment can be made, which is necessary with the critical tubes now on the market. The usual tube noises are practically eliminated. Music and signals were clear with a slight increase in volume.

The SOCOSTAT is built right. A nickel plated receptical, securely mounted in a heavy Bakelite base, will take all standard base, 4 prong tubes. Heavy flat spring contacts are used insuring a positive contact. The connections are on the outside and are plainly marked. The internal rheostat is composed of the highest grade of resistance wire wound on a fibre strip. This strip is pressed into the Bakelite base making a smooth surface over which a heavy spring contact moves quietly and with a positive even contact at all times.

The SOCOSTAT is sure a big improvement over the old method of using separate sockets and rheostats. Have shown it to several of the boys and all agree that it is O. K. It should go big with the Radio Bugs.

Very truly yours.

C. H. Geyer.

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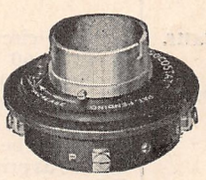
Mr. C. H. Geyer had some experience with Radio during the war as a Naval Aviator. He now owns an electrical supply store in Kenmore, N. Y. and is known as a Radio expert in his vicinity.



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The beginner need fear no difficulty in operating these transformers in cascade successfully with a large gain on each stage —without the advice of a consulting engineer to guide his efforts.

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TYPE RT-5 a transformer of high radio frequency amplification specially selected for the first stage for the amateur range only, 150 to 300 meters. RT-5A is a transformer that is interchangeable for the second and third stages.

TYPE RT-6 a special transformer of equally high radio frequency amplification for the first stage, for the broadcast range only. 300 to 600 meters. RT-6A is a transformer that is interchangeable for the second and third stages.

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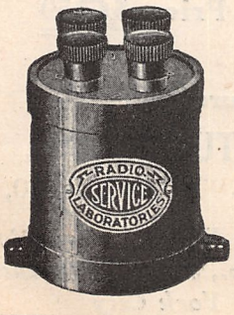

reception of short wave-lengths during the summer months when statics prevent any distance being covered by amateur signals, and it is to be hoped that something will be developed of a practical nature along these lines that will enable radio communication to be entirely free from atmospheric disturbances. —*Abstract from an article in our French contemporary "Radio Electricité."*

The Universal Receiver

(*Continued from page* 1078)

to different aerial constants, condenser values and tube requirements, coils of the size mentioned are not correct for all installations. It will be advisable to experiment somewhat if best results are to be obtained.

The single circuit does not operate as well as the double circuit for amateur reception. On 360 meters, the results are even; on 600 meters it is advisable to use a double circuit if distance reception free from interference is desirable. For all waves above 600 meters the single circuit will be found to give good results.

The values given here hold for almost all types of unit coils. Thus, where G-R 50 is specified an L 50 or a DL 50 may be used. It is well to experiment with various sizes of coils for each wave-length, as the sizes mentioned may not hold true for all installations.

200 METERS

For 200-meter reception with a single circuit receiver, the tuning inductance may be a single layer coil of 20 or 30 turns. The tickler coil is not very critical but must be experimented with for best results. A 40 or 60 turn single layer coil or a G-R 50 will be found suitable.

If a double circuit hook-up is employed the primary may be a 20 or 30 turn single layer coil, the secondary a 30 or 40 turn single layer coil and the tickler a G-R 50 or one of the larger single layer coils.

360 METERS

If the experimenter is not familiar with the tuning of a double circuit it would be advisable to employ a single circuit for 360-meter reception. With the set regenerating properly, there is seldom any more interference with this circuit than with a good double circuit. In fact, it is generally more selective for a beginner, as he cannot help but tune it sharply, while the double circuit will bring in any quantity of interfering waves unless adjusted precisely.

For a single circuit, the tuning inductance may be a single layer coil of 30 or 40 turns. The tickler may be of 60 turns or a G-R 50 or 75. If a double circuit is used, the primary may be a 30 or 40 turn single layer coil or a G-R 50. The secondary a 40 turn single layer coil or a G-R 35. The tickler coil may be either a 60 turn or a G-R 50 or G-R 75.

600 METERS

Single circuit. Tuning coil a single layer of 40 or 60 turns or a G-R 50 or G-R 75. Tickler of 60 turns or a G-R 75.

Double circuit. Primary and secondary may be same as in single circuit. The secondary should be slightly larger than the primary. G-R 75 as primary, G-R 100 as secondary, and G-R 75 as tickler generally works well. A larger tickler coil may be required with some tubes. The values are correct for a C 300 detector tube. It will be noted that, with a .002 M. F. condenser shunting the phones and B battery, regeneration up to 20,000 meters may be secured with a 100, or even a 75 twin unit coil. However, best results are obtained with a tickler coil, of approximately the inductance of the tuning or secondary coil.

1500 METERS

Single circuit. Primary G-R 150 or G-R 200. Tickler G-R 150.

$3 makes your PHONOGRAPH the best loud speaker

UNSCREW HEAD PHONE CAP AND REPLACE WITH HUGUENOT

HUGUENOT
RADIO - PHONOGRAPH ATTACHMENT

NO metal parts to bend.
NO leaks or loose connections to decrease efficiency.
Quickly and easily attached.

Utilizes the scientifically designed tone amplifier of the phonograph to reproduce and magnify radio concerts and messages. Connects head-phone with phonograph tone-arm. Made of black polished hard rubber.

SINGLE PHONE CONNECTION $1.00

Mail orders filled promptly on receipt of remittance. Specify make of phonograph and head-phones.

McKENZIE ENGINEERING COMPANY
NEW ROCHELLE, N. Y.

Special discounts to the trade.

DEALERS!

Are you ready for the holiday trade? Are your connections of such a nature that you can depend on RUSH ORDERS being put through on time? We can guarantee prompt delivery, and our discounts are most liberal.

We are Jobbers For

Grebe Receiving Sets
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Write For Our Special Proposition "Z"

THE RADIO SHOP
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NEWARK, N. J.

CARDBOARD TUBING

Seamless—Grey	Per Inch or Fraction	Per Ft.
2½, 3 and 3½ in. O. D.	3½c	30c
4, 4½ and 4⅝ in. O. D.	4c	35c
5 in. Outside Diameter	4½c	42c
5½ and 6 in. O. D.	5c	50c

Postage Extra—Shipping Weight, 1 lb. per ft.

Dealers Write for Discounts

MICHIGAN RADIO CO.
2173 Hillger Ave. Detroit, Mich.

The Moon Loud Speaker either pleases You or we return your money! Now read on:

Something About "Bunk!"

There's been an all-powerful lot of bunk written about Loud Speakers by over enthusiastic ad writers. If you listen to them, a loud speaker will do everything a $200 power amplifier does.

We make no such claims. We are not trying to insult your intelligence.

The Moon Loud Speaker stands 15 inches high, is made of highly polished, heavy aluminum. Heavy black iron sound channels, maple wood sound distributor. Highly decorative. Price is within reach of all.

Modestly We State:

We *do* claim that the Moon is the best loud speaker on the market and we are perfectly willing to give you the opportunity of proving this fact to your own satisfaction.

Ask your radio dealer for a test. If he hasn't one in stock, be sure to give us his name and address. We prefer, naturally, that you buy of him. However, if you send direct to us we will ship you one C. O. D. If you are unhappy with your purchase after five days' trial, ship it back and your money will be refunded

Remember This:

Moon Loud Speakers will not work successfully on a detector set. They require one or more stages of amplification.

Also remember that something has to go in the blamed thing before anything comes out. This Moon is no miracle worker. Also remember that there is no static strainer in it—if static goes in, right away it comes out. Don't blame the speaker. A $1000 set won't strain out static, so it isn't to be expected for $7.50

Why not be reasonable—we are.

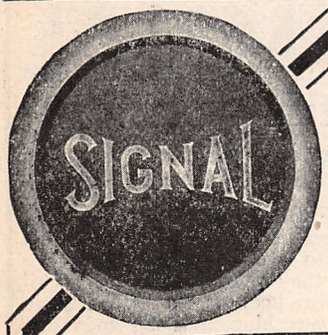
Here's a Strong Finish!

We're business men after business and results. We believe every one wants and needs an accessory of this kind. For $7.50 you let the whole family listen in on the good things.

We also know that we've stumped several radio high-brows as to the reasons for this Moon's efficiency. They are honestly puzzled as to what does it!

Here's where to write:

The Wilson Utensil Co.
Dayton, Ohio
Manufacturers



Junior Detector Units

For the amateur, and also the rapidly growing commercial field, we have developed an entirely new line of apparatus, in which is incorporated the very latest advancement of the science of Radio.

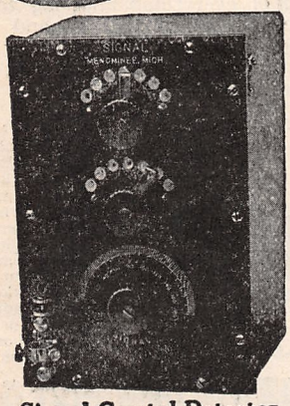
Each individual unit is primarily a separate and distinct device, complete in itself, yet by adding one to another any combination may be obtained, from the simple crystal detector through all the stages of radio-frequency and audio-frequency amplification.

Seasoned knowledge and experienced handicraft are built into these units—the product of a plant and an organization whose history in Radio dates back to the earliest days of "wireless."

The instrument illustrated is undoubtedly the best type of crystal set ever offered.

Its Special Features Include:

High grade 21-plate condenser.
Device for locking catwhisker into positive position after live spot is obtained. No jarring or vibration of the set can destroy this positive contact.
Range 150 to 600 meters, which may be increased to 12,000 meters by attaching loading coils.



Signal Crystal Detector Type 110

Space forbids complete description. Send for our Booklet and Special Bulletins. For certainty of Radio results insist on SIGNAL parts and sets. For sale by dealers everywhere.

(1898)

SIGNAL Electric Mfg. Co.

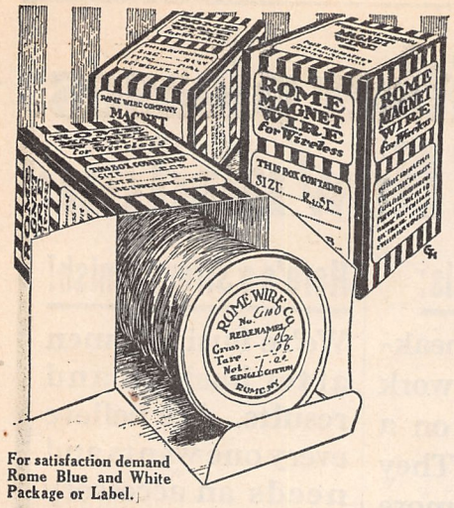
Factory and General Office
1912 Broadway, Menominee, Mich.

Atlanta, Boston, Cleveland, Chicago, Minneapolis, Montreal, New York, Pittsburg, St. Louis, San Francisco, Toronto

You'll find our local address in your Telephone Directory

Coupon for Guide to Radio Satisfaction

Please send, without obligation, your interesting book about SIGNAL parts and sets, to the name and address written in the margin of this page.



For satisfaction demand Rome Blue and White Package or Label.

ROME RADIO WIRE

Magnet Wire

Best Quality Plain Enamel Covered; Enamel and Single or Double Cotton Covered; Single or Double Cotton Covered.

All sizes: ¼- lb. to 40-lb. packages.

Antenna Wire

Best Quality Solid or Stranded Copper Antenna Wire, plain or tinned; put up in lengths of 100-ft. and 150 ft., or on 24″ reels of 200 lbs.

At Your Dealer's

ROME WIRE COMPANY

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3500 Ohm Headset, $8.00
2200 Ohm Headset, $6.00

MANUFACTURED BY

The Carlisle & Finch Co.
229-231 E. Clifton Avenue
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Eastern Representative:
W. K. Thomas, 41 Park Row, New York

NICK'S RADIO BARGAINS

VARIOMETERS	(150 to 600 Meters)	$2.74
COUPLERS	(150 to 600 Meters)	2.43
43 PLATE VARIABLE CONDENSERS		2.56
23 PLATE, $1.91	11 PLATE	1.70

The return of these instruments gladly accepted if not satisfactory

Note.—The Radio News would not insert this ad if we handled UNSATISFACTORY MERCHANDISE.

NICK'S RADIO SHOP 26 N. Desplaines St. Chicago, Ill.

2500 METERS

Single circuit. Primary G-R 250. Tickler G-R 150. These coils allow reception of the time signals from NAA, the daily amateur code from NAH (New York) and commercial shore stations operating C. W. sets on 2,200 meters.

5000 METERS

Single circuit. Primary G-R 400. Tickler G-R 250. Numerous medium and high-powered stations may be heard working C. W. on or about 5,000 meters. NAW (Guantanamo, Cuba) has been heard very QSA is New York on one tube. This was accomplished during the summer months and is possible almost every night. NAJ broadcasting (telegraph) market reports, etc., is located at the Great Lakes, Illinois, and may be heard at any time during operation.

10000 METERS

Single circuit. Primary G-R 1,250. Tickler G-R 500 or 750. On a 60′ aerial located in New York have heard UFT in France. Not especially constant or loud but of a readable audibility; A C-301 was used for long waves in preference to a C-300. A WE "E" tube operates well as a long wave detector, although it is poor when used for short-wave reception. Although the coils mentioned will cover a considerable range around 10,000 meters, it will be beneficial to possess a 1,500 and a 600 turn coil.

CONCLUSION

If possible, a 200′ to 500′ aerial, single wire, should be used for reception of waves over 800 meters. For amateur reception it is rarely permissible to use an aerial greater than 130′ in length.

If a double circuit is employed, the coils specified for a single circuit may be used in the primary and tickler sockets. The secondary is generally of the same size as the primary. It is seldom necessary to utilize a shunt connection of the primary variable. Unless carefully handled this connection will give poor results.

My Experience With the Super-Regenerative Circuit

(*Continued from page* 1082)

of 40 turns of the above-mentioned wire, as on coil "L," but this coil, "L-1" is tapped in eight groups of five turns each.

"L-2" is the tickler coil and consists of 25 turns of the same wire as on coils "L" and "L-1"; this coil "L-2" being wound on the same tube, the secondary, of the coupler as that holding "L-1," the winding being adjacent to coil "L-1."

"L-3" is a standard variometer, with the rotor terminal hooked or connected to the plate terminal of the tube, this being an important feature of the hook-up under discussion.

"L-4" is a honeycomb coil of 1,500 turns, shunted with the condenser "C-5" the capacity of this condenser being .0025 mf., consisting of a .002 mf. fixed condenser and a .0005 mf. variable in parallel.

"L-5" is also a honeycomb coil, but of 1,250 turns.

Coils "L-4" and "L-5" should be mounted in such a way that their inductive relation can be varied. I have found that the best results are obtainable when these coils (L-4 and L-5) are set at right angles (90 degrees) to one another.

Condenser "C-1" is a .00025 mf. variable condenser of the vernier type; "C-2" is a .0005 mf. variable condenser also of the vernier type, while "C-3" is a .001 mf. fixed condenser, and "C-4" is a .0005 mf. grid leak condenser.

"B-1" is a "B" battery, "B-2" is an "A" battery, or storage battery, while "B-3" is

High Efficiency

HEAD SETS

Army and Navy Type:	
2500 ohms, per pair	$10.00
3200 ohms, per pair	12.00
Swedish-American Type:	
2200 ohms, per pair	8.00
Victor Type:	
Double pole, single coil	6.00

Jacks, Plugs, Microphones, and other Radio Parts

Ask for our Liberal Trade Prices

American Electric COMPANY
CHICAGO - U. S. A.

HOMMEL

Everything for Radio

Immediate Shipments on Sets or Parts

DEALERS! Keep your radio customers in good humor by being able to give them everything they want when they want it.
That's why we keep such a large reserve stock of everything applying to radio. Place your orders with us and be sure of prompt service. For ordering, see our new illustrated price list No. 200-S. A post card will bring it.

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NATIONAL RADIO CO.

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Manufacturers of "Lisenlin"

3000 Ohm Phones $7.50, Variable Condensers, Dials, Etc.

Write for proposition

No. 57 Receiver

Price, $98.00

Go As Far As You Like

Long Distance Reception Now a Reality

The Federal No. 57 RADIO RECEIVER

makes available to the novice all that is newest and best in Radio Receiver Equipment. It combines simplicity and reliability of operation with a sensitiveness that is unrivaled; giving an extraordinarily high degree of amplification and making possible the reception of

Radio Signals over Marvelously Great Distances.

WRITE FOR

BULLETIN No. 119-W

IT COMPLETELY EXPLAINS

RADIO FREQUENCY AMPLIFICATION

Federal Telephone & Telegraph Co.

BUFFALO, NEW YORK

DECEMBER RADIO SPECIALS

ALL ORDERS MUST BE ACCOMPANIED BY CASH NO GOODS SENT C. O. D.

Special Low Prices
ALL STANDARD MAKES

SEND MONEY, STAMPS, CHECK OR MONEY ORDERS

ARRESTERS

Regular Price		Sale Price
$2.50	Brach Inside Type Approved	$1.75
3.00	Brach Outside Type Approved	2.75
2.00	Keystone Approved	1.75
3.75	100-A. 600-V. Comp. Base Switches	2.00

AMMETERS

6.00	Radio Corp. 0-25A Hot Wire	4.10
6.25	Radio Corp. 0-5A Hot Wire	4.00

BOOKS

2.25	Practical Wireless Telegraphy	1.50
2.50	Prepared Radio Measurements	1.50
2.25	Radio Telephony	1.50
2.25	Wireless Experimenters Manual	1.50
1.50	Radio for Everybody	1.10
.35	Lessons in Wireless Telegraphy	.25
.35	Experimental Wireless Construction	.25
.35	Operation of Wireless Telegraphy	.25
.75	Radio Hook-ups, by Sleeper	.59
.75	How to Make Commercial App	.59
.50	Const. Plans No. 1 and No. 2, each	.39

BINDING POSTS

.18	Hard Rubber Top, Large	.08
.12	Hard Rubber Top, Medium	.10
.10	N.P. Brass, 5/16 Diameter	.05
.12	N.P. Brass, 11/32 Diameter	.05

BUZZER SETS

2.70	Signal Key and Buzzer	2.00
.80	High Pitch Buzzers	.60

COILS

11.40	R 22 Signal Arlington Coupler	8.00
8.50	R 23 Signal 2,000 Meter Coupler	6.25
5.40	R 27 Signal Tuning Coil	5.00
5.00	Whitall Variocoupler	3.00

CLAPP-EASTHAM RECEIVERS

Type "HR" Regenerative Set, 180 to 825 meters, mahogany cabinet. Licensed under Armstrong U. S. Patents.

Regular Price	Sale Price
$40.00	$25.00

Type "HZ" Two-Stage Amplifier.

Regular Price	Sale Price
$40.00	$25.00
35.00 "HR," oak cabinet	22.00
35.00 "HZ," oak cabinet	22.00

THE IDEAL RECEIVER
"Radac"

Type "RZ" combines in one cabinet all of the good features of both the "HR" and "HZ"; 180 to 3,000 meters. Solid mahogany cabinet, the latest type made.

Regular Price	Sale Price
$100.00	$65.00

Opportunity like this comes only once. Act now. Don't delay.

CONDENSERS

Regular Price		Sale Price
$2.25	Fesco 3 plate variable	$1.65
3.25	Fesco 11 plate variable	2.40
4.00	Fesco 21 plate variable	3.00
4.75	Fesco 43 plate variable	4.00
.35	RTL Fone Fixed .001	.25
.35	RTL Grid Fixed .005	.25
.35	RTL Grid Fixed .00025	.25
.50	G.A. Grid leak Meg. .0005	.30
.35	G.A. Grid .005	.25
.35	G.A. Phone .0025	.25
.70	Paragon Moulded .001	.50

PHONE CORDS

Regular Price		Sale Price
$0.80	Double 5 feet cords	$0.35
.50	Single 5 feet cords	.25

PHONES

7.75	Baldwin "C" units	6.00

PLUGS AND JACKS

1.25	Frost Plugs for tips	.75
.70	Open Jacks, Federal	.55
.85	Closed Jacks, Federal	.60
1.00	2 circuit Jacks, Federal	.80
1.20	1 circuit Fil. Cont	1.00
1.50	2 circuit Fil. Cont	1.20

ROTORS

.75	Composition, 3 11/16 Diameter	.50

SWITCH POINTS AND LEVERS

.50	Paragon Switch Levers	.25
.50	Whitall Switch Levers	.35
.03	Switch Points, ¼x⅛, per dozen	.10
.05	Switch Stops	.02½

SOCKETS

.75	Whitall No. 707, Bakelite	.50
1.00	Whitall No. 706, Square	.50

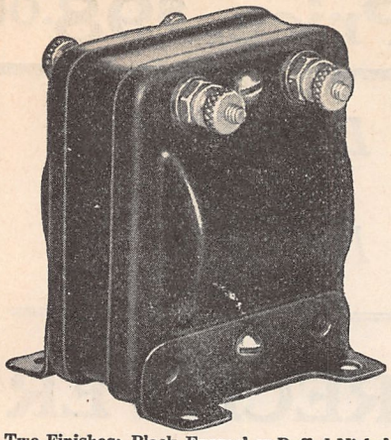
MAGNET WIRE, DOUBLE COTTON COVERED
¼-Pound Spools

.35	No. 18 D. C. C. Price, per spool	.29
.35	No. 20 D. C. C. Price, per spool	.31
.45	No. 22 D. C. C. Price, per spool	.34
.50	No. 24 D. C. C. Price, per spool	.38
.55	No. 26 D. C. C. Price, per spool	.47
.65	No. 28 D. C. C. Price, per spool	.55
.85	No. 30 D. C. C. Price, per spool	.60
.60	No. 23 S. S. Price, per spool	.50

Illustrated Catalogue and Code Card Free with every order

THE WHITALL RADIO CO. Springfield, Mass.

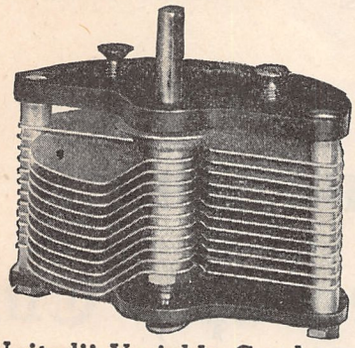
"United" Radio Products



Two Finishes: Black Enamel or Buffed Nickel Plated, $4.50

"United" Audio Frequency Transformer

The beauty of the outside of this transformer is but a reflection of the superb workmanship under the shell—no howling—no distortion—clear amplification for one or more stages.



"United" Variable Condensers

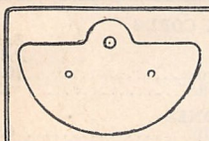
PRICES

43 plate, $4.50
23 plate, 4.00
11 plate, 3.50
5 plate, 2.75
3 plate, 2.25

Without dial or knob

That United Condensers have become the standard with manufacturers of radio sets, by which all others are judged, is, in itself, the strongest endorsement of their superior construction and effectiveness.

Ask your dealer to show you this condenser. Then you, too, will appreciate why it has been accepted as the standard.



Mounting made easy by our template for locating panel holes, packed free with each condenser.

NOTE—Any advertised claim of having an arrangement with us to sell our products at special prices, is fraudulent.

UNITED MFG. & DISTRIBUTING CO.
536 LAKE SHORE DRIVE-CHICAGO

JEROME RADIO CORPORATION
Manufacturers
RADIO APPARATUS
CHICAGO

Factory: 3136-8 W. Chicago Ave.
Gen. Sales Office: 608 So. Dearborn

BETTER RADIO

The January issue of RADIO NEWS will contain an important announcement about the new ABC Tuner developed by Professor Morecroft. Look for it—literature sent on request.

JEWETT MANUFACTURING CORP.
226 Sherman Ave. (Dept. R12) Newark, N. J.

"BECOME A LIGHTNING TRICK CARTOONIST"
Send $1.00 for Snappy Program of Trick Cartoon Stunts and Complete Instructions: Circulars Free;
BALDA ART SERVICE, Dept. 14, Oshkosh, Wis.

the "C" battery, this last battery being made variable to range from 3 to 10 volts, adjusted until the best results are obtainable, then marked and fixed. Each type of tube will require a slightly different voltage, whereas the two V. T. 1, or "J" tubes, that I am at present using, require 7½ volts for the best results.

"R-1" and "R-2" are rheostats of the vernier type.

To Much Radio

(*Continued from page 1095*)

I get signals from S.O.L. and P.D.Q. practically every night by tuning to C-sharp and think I can get A.W.O.L. and H_2O by cutting in an interlocking relay between the honeycomb and the Washington monument. Do you think that I would get better wavelengths if I connected a circuit breaker in series with the tabulator key and used weatherproof conduit in the magneto? Neither do I, but it is practically impossible to get good spread rods since the country went dry and unless I use something to cut down the static and decrease the potential of my motometer, the fluctuations of the variometer will tend to synchronize with the alternations of the high frequency kick-back preventer and burn out the secondary windings of the eccentric bushings.

Until recently I used a 5-string, tenor, hardwood amplifier with 240 turns of No. 4¼ barb wire around the front sight cover, but I found that with this arrangement, the follicles of the heating element had a tendency to become impregnated with the pigment from the valve stem, so on advice from General John Pershing, I removed the drift slide and substituted a Duplex automatic stoker, which allows the left dorsal ulna bone to oscillate between the hydrometer and the upper sling swivel and prevents the choke coils from short-circuiting the permanent wave-length.

I was wondering if by placing the blow-off cock in juxtaposition to the universal joint on the loop aerial and using an emergency application of air on the primary windings, would the cubic capacity of the variable condenser in any way affect the centrifugal dirt collector on the three-way switch of the microphone, and if so, would this be a reversible reaction? Also, do you think that by using more chalk and a little high English on the cue ball, would the pilot beam interfere with the insulation on the super-heater pipes?

Any suggestions you have to make in regard to the above matters will be greatly appreciated by,

Yours very truly,
FRANCIS P. MCCARTY

P.S. I am attaching a rough sketch of my set, from which you will note that there is a swinging short across the "B" battery to neutralize the action of the lateral-cut hydro-static system.

A Radio Sound Intensifier

(*Continued from page 1084*)

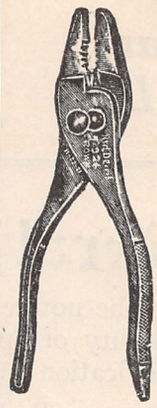
The nipples were removed from the old spokes and were cleaned well and polished. The spokes were cut off exactly 2½ inches long from threaded end; a small washer was fitted on the other end and the end of spoke riveted over and the two sweated together neatly. They were then copper-plated and silvered, the same as the reflector; four spokes were required (see Diagram No. 3).

Next a strip of stout sheet brass was cut, as shown, and holes were bored for screws. A large hole was made to take the projection

TRADE MARK Red Devil Tools

"Red Devil" Slip Joint Plier

A Tool of Many Uses



YOU will find a multitude of practical uses for it—for adjusting the radio set, tightening nuts, screws, binding posts, etc.

The thin nose reaches hard-to-get-at places. The scientifically shaped, dentyne knurled handles fit the hand snugly. Forged of steel, beautifully nickel-plated.

Style 924—6½ Inch. At radio or hardware dealers, or us, 50c.

MECHANICS' TOOL BOOKLET FREE

SMITH & HEMENWAY CO., INC.
Mfrs. of "Red Devil" Tools
273 Broadway, New York, N. Y.

CABINETS $2.00

We are in a position to offer you handsome radio cabinets at the very low price of $2.00 each. The regular price of these everywhere is $4.00. These cabinets are of uniform size, 7" x 7" x 7", with hinged cover and brass suit-case style catch. Each is beautifully mahogany finished, with rubber bumpers on bottom to prevent scratching of furniture, etc. Cabinets sent prepaid upon receipt of check or money order. Order to-day.

STROMBERG - CARLSON PHONES $5.00

We have a quantity of these famous No. 2-A Stromberg-Carlson 2,000 ohm double headphones which we can offer at the startling price of $5.00 each These phones are sold everywhere for $7.50 each. Each set is fully guaranteed by the manufacturer. Order now—they won't last long. Sent prepaid upon receipt of check or money order.

We also have some coils for use in crystal sets at 50 cents each—bakelite binding posts engraved "TEL," "ANT" and "GND" at 10 cents each or 40 cents for set of four.

SAVE MONEY—ORDER NOW!

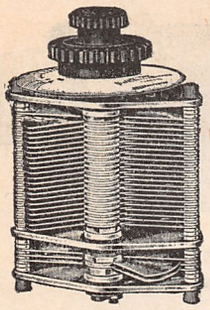
NATIONAL SERVICE COMPANY
1834 Broadway New York City

HYGRADE SPECIALS

Radiotron Tubes, U.V.200-4.50—U.V.201	$5.75
No. 766 Eveready Variable B. Battery	1.98
No. 774 Eveready Variable B. Battery	3.98
45 volt Cyclone Variable B. Battery	2.50
Electros Insulators, per dozen	2.00
7-stranded Copper Aerial Wire, 200 ft	1.00
Arkay Loud Speakers	3.89
.001 M.F. Signal Variable Condensers with Dial and Knob	3.98
Thordarson Amplifying Transformers	3.49
Acme Amplifying Transformer (mounted)	4.25
Federal Amplifying Transformers	5.95
Skindervikin Transmitter Buttons	.75
Firco Bull Dog Grip Phone Plug	.98
Rheostats, Fada 69c, DeForest	.98
Klosner Vernier Rheostats	1.15
Federal 2200 Ohm Head Set	6.95
Dictograph 3000 Ohm Head Set	9.75
Western Electric Head Set	11.95
Baldwin Type "C" Head Set	14.75
Sterling Rectifier	13.95
"MARKO STORAGE BATTERIES"	
6 volt 30 amp. guaranteed 2 years	10.00
6 volt 60 amp. guaranteed 2 years	12.95
6 volt 80 amp. guaranteed 2 years	17.00
6 volt 100 amp. guaranteed 2 years	21.00

Above prices are F. O. B. New York

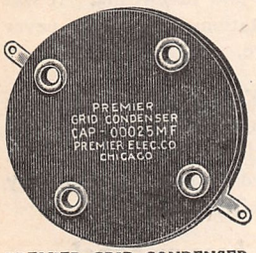
HYGRADE ELECTRICAL NOVELTY CO.
41 WEST 125th STREET, NEW YORK, N. Y.



PREMIER
VARIABLE CONDENSERS

Have Greater Capacity than any other condensers selling at the same price — That's what you need for radio.
Rigid Construction—Head, rotor and stator plates are hard aluminum, all other materials brass and Bakelite.

II Plate Vernier
Capacity .0004 M.F.
Complete with Dial
Write for Complete Bulletin
PRICE $4.50



PREMIER GRID CONDENSER

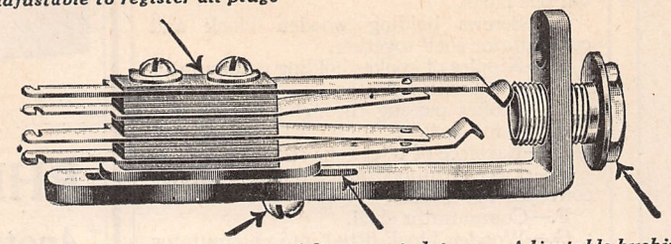
Well made and extremely uniform in capacity. Two Bakelite discs firmly hold the aluminum storage plates. A quality condenser at the right price.

PRICES
CAP. .00025 M.F., 35c
CAP. .0005 M.F., 50c

THIS "UNIVERSAL" RADIO JACK SAVES YOU $1.00

Unit type spring mounting adjustable to register all plugs

Solid Brass Frame



Locking screw for spring unit *Adjustment slot for spring unit* *Adjustable bushing for panels 1/8" to 7/16"*

HERE'S HOW

FITS ANY PLUG—You don't need to buy a so-called "Radio" plug—Ask your local telephone man for an old telephone plug; he will give you one for little or nothing. A PREMIER JACK IS ADJUSTED TO FIT IT IN A "JIFFY."

ADJUSTABLE THIMBLE OR BUSHING—Permits mounting on any thickness panel—no spacer washers required, thus more finished, "He-knows-what-he's-about" appearance when mounted on panel. HIGH GRADE INSULATION—tested for 500-volt breakdown. All metal parts nicely nickel plated.

PRICES—ALL SPRING COMBINATIONS

No. 131—Two Circuit, Double Cut-off..... $0.90
No. 133—Open Circuit.....$0.65 No. 135—Three Spring Auto. Fil. Control.. $1.00
No. 134—Two Circuit, Single Cut-off .75 No. 136—Five Spring Auto. Fil. Control.. 1.25

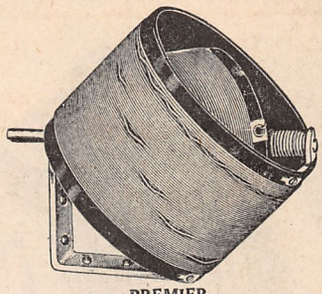
All good dealers carry Premier Radio Products—
Postpaid direct though, if they can't furnish.

Write for Bulletins describing fully all distinctive features found only in radio apparatus and complete sets manufactured by us.

Premier Electric Company

Manufacturers—Est. 1905

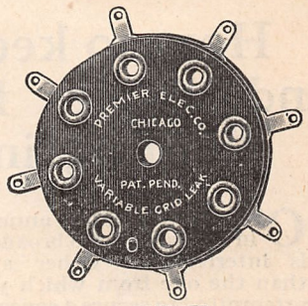
3804-3810 RAVENSWOOD AVENUE CHICAGO, ILL.



PREMIER
"MICROMETER" VARIO-COUPLER

Has 180° orientation and with 20 Antenna taps permits sharp and more sensitive tuning. Adaptable for either single circuit, or loose coupled tuned plate hook-ups. Wave length ranges from 200 to 600 meters. All metal parts brass—contacts positive—stays "put" at any angle. In short, a Premier quality Vario-Coupler that will give you every satisfaction.

PRICE $4.50



PREMIER
"7-IN-1" VARIABLE GRID LEAK

Has seven values of leak resistance of ½ Megohm each between terminals. Bakelite discs protect "leaks," assuring permanency of resistance. Don't guess—a grid leak is a mighty important unit in securing the best results from all tube sets. A Premier Variable makes this sure and easy.

PRICE 50 CENTS

Announcing—

The New "All-American" Audio Frequency Transformers

(COMPLETELY SHIELDED)

Amplification—the Soul of Radio

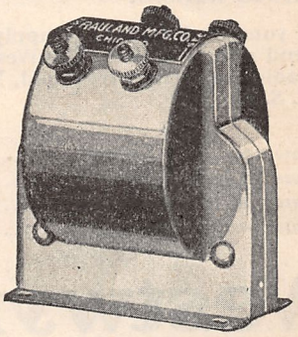
However perfect your set may be, the least fault in your Radio or Audio Amplification takes the heart and soul out of your receiving set.

"All-American" Transformers

Perfected, first, from the stand-point of *correct* engineering, by proper turns ratio, impedance and shielding — then, in our latest models, given the finishing touches of outward beauty that the more critical eye demanded. The shielding is a highly polished, heavily nickeled brass case.

The new R-21, Ratio 5 to 1 has an amplification constant approximately equal to that of our R-13 (10 to 1) but can be used on as high as three stages without distortion or howling.

Send for bulletin No. 22, showing successful Radio and Audio Frequency hook-ups. ***Your dealer has "All-American" Transformers.***



Type R-12
Ratio 3-1
$4.50

Type R-13
Ratio 10-1
and
Type R-21
Ratio 5-1
$4.75

RAULAND MFG. CO.

35 So. Dearborn St., Chicago, Ill.

of the reflector, to which it was soldered when assembled (see Diagram No. 4).

The old horn was cleaned well with gasoline and was left ready to cut to the proper length when the complete apparatus was ready to assemble.

See Diagram No. 5 for sketch of apparatus when assembled; the letters indicate the various parts.

A.—Screws holding wooden block and commutator shell together.

B.—Nipples of spokes holding commutator shell central with reflector.

C.—Spokes passing through reflector and commutator shell.

D.—Earpiece of telephone receiver.

E.—Piece of rubber bulb as sound deflector conveyor to reflector.

F.—Commutator shell.

G.—Wooden block fitted into commutator shell, in which telephone is fitted.

H.—Adjusting screw to press receiver against rubber washer M.

J.—Holes for waves from telephone receiver.

K.—Holding down clip for front of reflector.

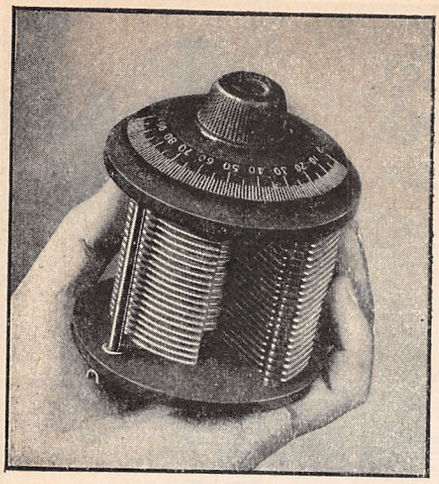
L.—Brass standard screwed to base and soldered to reflector.

M.—Rubber ring made from inner tube of motor tire.

The arrangement of using the old aluminum commutator shell for holding telephone receiver can also be applied in a different manner. If the wooden block is turned flat it could be screwed to the top of the radio cabinet and a large horn fitted on the small end of the commutator shell as amplifier. The whole idea is to utilize waste materials to manufacture useful apparatus from same at very little cost to the maker, or if a number of holes were drilled in the side of the cone and the holes tapped to take 3/8-inch brass pipe, it could then be fitted with rubber tubes, which could be fitted with earpieces of glass tubing and used by a number of persons to hear the radio broadcast.

Part of a brass knob taken from a bed or a door could be used instead of rubber.

Procure a telephone receiver, the diameter of the cover of which is less than that of the inside of a commutator shell which is two and thirteen-sixteenths inches. The depth from the face of the earpiece to the back of the telephone does not matter much, as a wooden case must now be made to fit inside of the commutator shell; in this wooden case, part is turned out to hold the rest of the receiver. A rubber ring is put inside the commutator shell and the earpiece rests against it. The wooden case is then put in place and with the commutator shell it is held firmly by four screws. An adjusting screw at the end of the wooden case presses the earpiece tightly against the rubber ring and makes an airtight joint. The connections can be brought out through the wooden case of flexible cable, or otherwise, to suit the maker. Diagrams of each part are shown, as well as of the assembled instrument. When all parts are ready, proceed to assemble as follows:—Take commutator shell reflector and four spokes; pass a spoke from the outside of the reflector into a hole in the commutator shell and screw on the nipple; do the same with the other spokes. The shell is then held in the center of the reflector with the narrow end pointing towards the polished face of the reflector. Tighten up the nipples evenly until the shell is rigid, with no wabble or shake. The piece of rubber horn bulb is cut so that there is a space between it and the face of the reflector when slipped over the end of the commutator shell opening. The brass strip is slipped on outside and fastened to a neat wooden base. The edge of the reflector rests on the wooden base and is held down tight by a screw and clip. When the reflector is fixed on the base, the brass strip may be soldered to the back of the reflector. When the telephones are inserted, the block placed in position, screwed tight and the back adjusting screw tightened up, all is then complete to connect up to the set.



How to keep undesirables from "butting in"

ONE of the greatest annoyances in receiving radio broadcasting is interference. Other stations than the one from which you are attempting to secure a concert keep "butting in," The surest way possible to prevent interference is to employ one or more Westwyre Variable Condensers. Not only do these remarkable little instruments enable you to more readily *select the station you desire* where two or more are broadcasting on approximately the same wave-length, but it *tends to increase the strength of incoming signals and eliminate interference from undesired stations.*

If your dealer cannot supply you, send money direct. The Westwyre Radio Company, Westfield, Mass., U. S. A.

43 plate	*.001 mfd. with dial*	*$5.00*
23 plate	*.0005 mfd. with dial*	*4.00*
11 plate	*.00025 mfd. with dial*	*3.50*
3 plate	*vernier with dial*	*3.00*

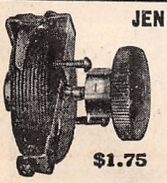
Westwyre
Variable Condensers

BURROWES

Home Billiard & Pool Tables

Magnificently made in all sizes, at all prices. Game exactly same as standard table. Become expert at home. Use in any room, on any house table or on its own folding stand. Quickly leveled. Put up or down in a minute. Full playing equipment free. Small amount down, small payments for a few months. Ask your dealer or WRITE us TODAY for Catalog.

E. T. BURROWES CO., 101 Free St., Portland, Maine

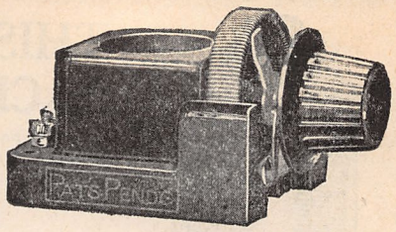


JENKINS VERNIER RHEOSTAT

Indispensable for adjustment on Radio Frequency and Detector Tubes. Patent instant cut-off switch. Write for folder. Liberal discounts to dealers and jobbers.

Manufactured and Guaranteed by
Unity Manufacturing Company
224 N. Halsted St., Chicago, Ill.
Phone Haymarket 1819

$1.75



KING RHEO-SOCKET

Another Radio Surprise

Price $3.00, f. o. b., N. Y. C.

This rheostat embodies compact, increased efficiency, having shorter connections and less wiring. It will bring in stations you have never heard before.

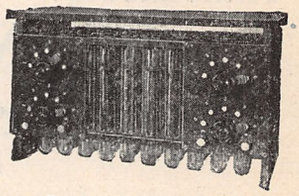
Make this King Rheo-Socket a part of your up-to-date set. A high-grade article in red bakelite with phosphor-bronze contacts and alloy resistance wire.

For base or panel mounting

KING AM-PLI-TONE
82 Church St., New York City

Mfrs. of the famous King Am-pli-tone

Jobbers: Wire or write for interesting proposition



KICO Radio Storage "B" Batteries for EFFICIENT Receiving

THINK over the following FACTS before buying again.

1. KICO "B" batteries allow single cell variations by means of switches mounted on panels. (The first in the market with this feature.)
2. NOT an ACID battery.
3. Rechargeable from your 110-volt A. C. line in connection with the rectifier supplied.
4. One charge lasts from three to six months in the detector plate circuit.
5. Neat, efficient and compact.
6. Unlimited life.
7. Your money back if unsatisfied within a 90-day trial.

			(Plain)	(With Panels)
16 cell	22 volt	.....	$6.50	.....
24 cell	32 volt	.....	8.00	$12.00
36 cell	48 volt	.....	10.00	14.00
50 cell	68 volt	.....	12.00	17.00
78 cell	100 volt	.....	16.00	21.00
108 cell	145 volt	.....	21.00	26.00

Literature gladly furnished.

KIMLEY ELECTRIC COMPANY
1355 FILLMORE AVENUE BUFFALO, N. Y.

You can be quickly cured, if you

STAMMER

Send 10 cents for 288-page book on Stammering and Stuttering, "Its Cause and Cure." It tells how I cured myself after stammering 20 yrs. B. N. Bogue, 881 Bogue Bldg., 1147 N. Ill. St., Indianapolis.

Hand Winding G. R. Solid Wire Inductance Coils

(*Continued from page* 1084)

The size of wire used depends upon the size of coil. For coils of 25 to 150 turns use No. 24 S.C.C.; for coils of 200 to 500 turns use No. 25 S.C.C.; and for coils 600 to 1,500 use No. 28 S.C.C. Obtain a spool of untwisted or just slightly twisted strand cotton yarn, commonly called electrical yarn, and mount, as shown in Fig. 1, beside the spool of wire. For all coils over 150 turns wind a full layer of wire on the tubing and fasten the end of yarn under the last turn by looping the yarn around one of the pins. For coils of 150 turns or less start the wire and yarn at the same pin.

Now have an assistant hold the wire and guide it in its proper place. With the right hand turn the spindle and with the left hand loop the yarn around the eleventh pin on the opposite side of the coil from the pin at which the yarn started. At the end of the next half revolution throw the yarn around the twelfth pin from the last which brings the yarn to a pin two spaces removed from the start pin. Continue the process using every 11th and 12th pin. It will be noticed that the wire weaves in and out of the yarn, and also that when all pins have a loop of yarn around them, the second layer (first layer in small coils) is only partially full.

Continue the process until the layer of wire is full, at which time there will be several layers of yarn between the two layers of wire at the start side of the coil and all the layers of yarn will be on top of the wire at the opposite side of the coil. The end of the 22d turn of yarn should fall midway between two turns already placed. The third and succeeding layers of wire are wound in the same manner until the total number of turns are put on. Either use an automatic counter or count each revolution of the handle to determine the number of turns.

When the last turn has been put on, fasten the wire with a bit of sealing wax. Withdraw the pins and slip the coil off the spindle. Give the sides and top of the coil a thin coat of shellac. Mount in the usual way. If the coils are to be used in a fixed circuit in which the coils will not be changed, a mounting composed of fibre strips across the center of the coil, as shown in Fig. 4, will be found advantageous.

The value of the assistant is that the turns of wire tend to separate considerably if not manually guided back into their proper locations. In conclusion don't attempt to wind the coils unless you possess considerable patience and also count your free time less valuable than the cost of the coils at a radio supply house. Approximately 250 turns can be wound an hour.

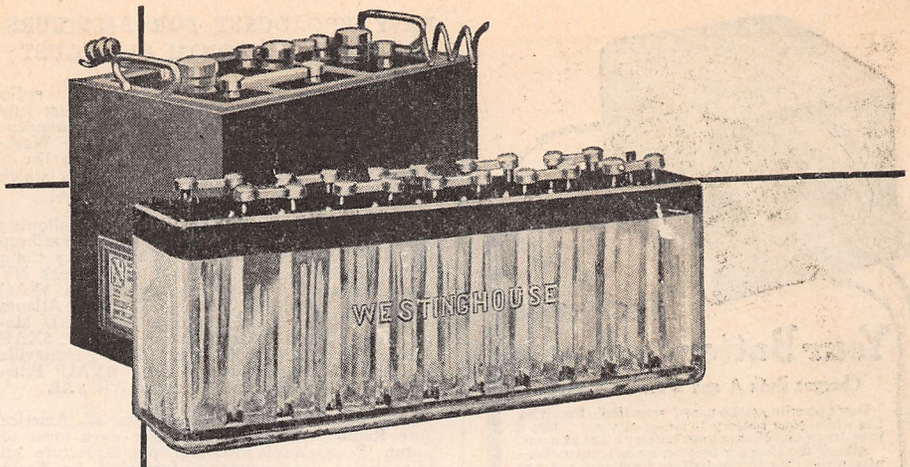
A rough estimate of the amount of wire required can be made beforehand by means of the following formula:

$$\text{Wt.} = \frac{3.14 \times N \times (D - d)}{24000} \times K$$

Where Wt. = weight of wire
N = number of turns
D = Approx. outside diameter
= 2.3 + .0015xN.
d = inside diameter. (2" in this case)
K = 1.3 for No. 24 S.C.C.
= 1.03 for No. 25 S.C.C.
= .54 for No. 28 S.C.C.

HOW TO MAKE AN ELECTRON TUBE DETECTOR UNIT

A circular describing how to make an electron tube detector unit, which may be used with apparatus previously described by the Bureau of Standards, is now being prepared for issuance. The estimated cost of the complete set is between $23 and $37, including the cost of batteries. Eventually the description will be available to the public through the Government Printing Office.



Built by Westinghouse —you know they're *right*

Nothing about a radio set is so absolutely essential to satisfactory receiving as *right* batteries. Westinghouse Batteries are not only correct in design, but durable in construction and thoroughly dependable in performance.

WESTINGHOUSE "A" BATTERIES are full-capacity, low-voltage, slow-discharge, long-life batteries, built especially for radio work. Ten types—27 to 162 ampere hours' capacity; 4, 6 and 8 volts.

WESTINGHOUSE "B" BATTERIES. The new Westinghouse 22-MG-2 is a rechargeable 22-volt "B" battery and a marvel for steady, noiseless, full-powered service. Glass case; visible interior. Lasts indefinitely. Two other types.

At your radio dealer's, or most any of the 2000 Westinghouse Battery Service Stations

WESTINGHOUSE UNION BATTERY CO., Swissvale, Pa.

WESTINGHOUSE

RADIO "A" and "B"
BATTERIES

WHOLESALE and RETAIL

We Have For Immediate Delivery

AMRAD
BALDWIN
CHELSEA
DE FOREST
DUBILIER
FADA
FEDERAL
GENERAL APPARATUS

Also a Full Stock of Other Radio Equipment. Write Us For Service.

ELECTRIC SERVICE ENGINEERING CO.
105 West 47th Street **NEW YORK CITY**

Recharge Your Battery at Home

Charges Both A and B Radio Batteries

Don't be without the use of your Radio Receiving Set while your battery is being charged. Get a Valley Charger and charge your battery right at home.

Attach the Charger to your home lamp socket—attach the clips to the battery terminals and you will get a quick, tapering charge which just exactly charges your battery, but cannot overcharge or harm it in any way.

Will charge the A 6 volt battery at a 5 ampere rate, and the B 22½ volt battery at the required ½ ampere rate. 45 volt B batteries may be connected in parallel so that they can also be charged.

SATISFACTION GUARANTEED. If your local distributor cannot supply you, write direct to

VALLEY ELECTRIC COMPANY,
Department R, ST. LOUIS, MO.

Mail the Coupon

Valley Electric Co., Dept. R, St. Louis, Mo.

Gentlemen: I am enclosing money order (or check) for $18.00, for which send me a Valley Battery Charger with five-panel glass display case and indicator. If not satisfactory, I will return it and get my money.

Name

Address

$18.00
F.O.B. St. Louis

NAVY BROADCAST FOR AMATEURS DURING THE MONTH OF AUGUST

1st—Radio amateur broadcast period radio service bulletin number sixty-three dated first July 1922 which may be obtained from Superintendent of Documents Government Printing Office Washington DC at five cents per copy contains a list of stations and their broadcasting schedules which broadcast market crop and weather reports.

2nd—Radio Amateur Broadcast The following special land stations and their call letters Winthrop Mass 1XQ Worcester Mass 1XS Waterbury Conn 1XT New Brunswick NJ 2XAM Great Neck NY 2XAN Belmar NJ 2XAO Philadelphia Pa 3XAG Washington DC 3XO Delanco NJ 3XP Atlanta Ga 4XI Tampa Fla 4XJ Orange Tex 5XAD Mobile Ala 5XAE Oklahoma City Okla 5XAF Abilene Tex 5ZAX Dallas Tex 5ZAY Fayetteville ARK 5ZAZ San Francisco Calif 6XAU Pittsburgh Pa 8XX and 8XW Madison Wis 9XL

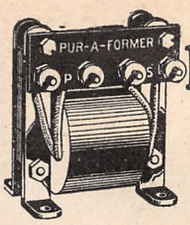
3rd—Following from Boy Scouts of America quote Radio Amateur number one gave town of Canton Pennsylvania its first public lecture on radio period Demonstration furnished by Scout Lazell Thomas who installed temporary receiving station using apparatus assembled by himself unquote

4th—The following broadcasting stations have been assigned call letters during the week beginning 17 July 1922 Ocean City Yacht Club Ocean City NJ WIAD Mrs Robert E Zimmerman Vinton Ia WIAE Gustav A Decortin New Orleans La WIAF Matthews Electrical Sup Co. Birmingham Ala WIAG Wilmington Elec Sup Co Wilmington Del WHAV Pierce Elec Co Tampa Fla WHAW Holyoke Street Ry Co Holyoke Mass WHAX Huntington Press Huntington Ind WHAY Rensselaer Polytechnic Institute Troy NY WHAZ Independent School District of Boise Boise Idaho KFAU Continental Radio & Mfg Co Newton Iowa WIAH Heer Stores Co Springfield Mo WIAI Fox River Valley Radio Sup Co Neenah Wix WIAJ Journal Stockman Co Omaha Wiak F M Tarbox Dunmore Pa (Temporary) WIAM

5th—Following received from Boy Scouts of America quote Radio amateur number two reports from Boy Scouts Camp Redding Connecticut that he copies NAA and NAH daily including Amateur broadcasts period supplies town with weather forecasts period no local paper and this is towns only prompt service unquote

6th—The following broadcasting stations have been assigned call letters during the week beginning 17 July 1922 Standard Service Co Norwood O WIAL Chronocle & News Pub Co Allentown Pa WIAN Reuben H Horn San Louis Osispo Calif KFBW Jacksons Radio Eng Lab Waco Tex WJAD School of Eng of Milwaukee & Wisconsin News Milwaukee WIAO Radio Development Corp Springfield Mass WIAP Chronicle Pub Co Marion Ind WIAQ J A Rudy & Sons Paducah Ky WIAR American Radio Co Lincoln Nebr WJAB F H Smith (Butte School of Telegraphy) Butte Mont WFBF Munsey Press Munsey Ind WJAF

7th—Code four—Following from Boy Scouts of America quote Boy Scout merit badge pamphlet on radio completely revised by S Kruse prominent amateur with advice of all government departments using radio



PUR-A-FORMER $3.50

Here's an audio amplifying transformer without any frills or fancy finishes—just solid honest value. The PUR-A-FORMER is compact and strongly built—amplifies without howl or distortion. Takes minimum space in your set and will produce results equal to many selling at double the price. Winding ratio 4½ to 1.

Buy them at all good dealers.

DEALERS ONLY—

Write for Harry Alter's RADIO "POCKETBOOK."

A net price catalog of radio supplies published each month. Our wholesale prices hit bottom.

The RADIO "POCKETBOOK" sent free to dealers only. Use your letterhead.

HARRY ALTER & CO.
We Sell Wholesale Only
126 N. May St. Chicago

EVERETT PHONES

Not the Loudest But the Clearest.
At Your Dealers
$8.50
EVERETT ELECTRIC CORP.
320 Broadway, New York

FOWLER'S PRACTICAL RADIO TEXT BOOK

Fowler's Practical Radio Text-Book tells you what you want to know about radio. The book explains radio in plain language; it helps the radio operator get better results from his set, and it is of value to the expert radio-electrician in presenting the latest facts and most recent developments in the science of radio communication.

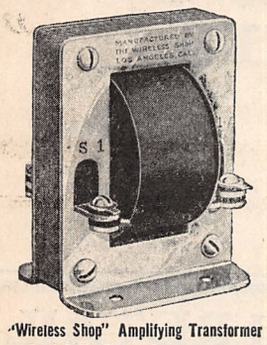
The book measures 8 inches by 5¼ inches, has 96 pages, 20 large illustrations; is substantially and attractively bound in cloth. The very latest work on radio. A most comprehensive survey of the science of radio communication. Send check or money order $1.25. We keep you posted with the latest radio improvements.

Schooley Stationery & Printing Co.
PUBLISHERS
250 Kemper Building
Kansas City, Missouri

Schooley Stationery & Ptg. Co.
250 Kemper Bldg.
Kansas City, Missouri
Please send "Fowler's Practical Radio Text Book."

Name .....
Address .....
City ..... State .....

BUY DIRECT FROM THE MANUFACTURER YOU SAVE 20%



"Wireless Shop" Amplifying Transformer
ONLY $4.00
Postage Extra

By Selling All Of Our Goods Direct We Are Able To Substantially Reduce Our Costs

YOU GET THE BENEFIT

"WIRELESS SHOP" APPARATUS IS NOW SOLD DIRECT from our own FACTORY ONLY

NO DEALERS—NO DISCOUNTS

The Amplifying Transformer Shown Is Only One Of The Many High Grade Instruments We Build. It Is Highly Endorsed By Radio Men Who Know And Your Satisfaction Is Guaranteed By The Name "WIRELESS SHOP". We Are Manufacturers—Not Assemblers. Ten Years of Radio Manufacturing—We Are Not Experimenting on YOU.

HAVE YOU RECEIVED OUR NEW CATALOG?
Fill In The Coupon Below and Mail It NOW—It Will Save You Money

THE WIRELESS SHOP, 1262 W. 2nd St., LOS ANGELES, CAL. Radio News-12
Be Sure and Send My Copy of Your New Catalog Showing New Prices to:—

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One Place Where QUALITY Always Predominates

THE WIRELESS SHOP
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CHRISTMAS MAGAZINES

See Our Special Clubbing Offer on pages 1246-1247 of this issue.

What gift for a friend could be more appropriate than a subscription to your favorite magazines?

A gift each month for a year!

Send us your list at once, we will enclose a special Christmas Card in your name upon request.

EXPERIMENTER PUBLISHING CO., INC.
53 Park Place, New York

9th—Code charts for decoding radio amateur broadcast are issued to all amateurs immediately upon becoming members of the radio amateur bureau period send applications for membership to radio amateur bureau Third Naval District South and Whitehall Streets New York City

10th—On and after August tenth the Radio Amateur Broadcast will be transmitted on one hundred fifty meters continuous wave immediately after the completion of the present radio amateur broadcast on eighteen thirty two meters

11th—Department of Commerce has assigned the following calls to broadcasting stations during the week of July thirty first WJAQ Capper Publications Topeka Kan WJAR The Outlet Co Providence R I WKAD Chas. Looff Crescent Park East Providence R I KFBH Thomas Musical Co Marshfield Ore WJAS Pittsburgh Radio Supply House Pittsburgh Pa WLAJ Waco Electric Supply Co Waco Tex KFR Airline Transportation Co Los Angeles Cal KFU Radio Corpn of America Standard Oil Co of Cal Pearl Creek Dome Alaska

12th—Department of Commerce has assigned the following calls to broadcasting stations during the week of july thirty first WXAC STAR PUBLISHING CO LINCOLN NEBR WIAY WOODWARD AND LATHROP WASHINGTON DC WJAH CENTRAL PARK AMUSEMENT CO ROCKFORD ILL WJAL VICTOR RADIO CORPN PORTLAND ME WKAF W S RADIO SUPPLY CO WICHITA FALLS TEX WIAS ELECTRIC SUPPLY SALES CO MIAMI FLA WJAN PEORIA STAR PEORIA RADIO SALES CO PEORIA ILL WJAP KELLSY DULUTH CO DULUTH MINN

13th—Following received from Boy Scouts of America quote (CODE TEN) Scouts Philip Thomas and Lisle Burlingame of Canton Pennsylvania trapped skunks to obtain funds for purchase of radio apparatus period station is installed and working efficiently

14th—Radio amateur broadcast period Miami Fla call letters NGE broadcasts daily on sixteen hundred twenty meters wind and weather forecasts and storm warnings for East Coast of Florida Miami to Key West advisory messages relating to storm warnings issued for middle and south Atlantic and East Gulf coasts and eight a m barometric pressure wind direction and velocity and state of weather at Miami at eleven thirty a m period storm warnings and advices issued in afternoon at six p m period hurricane warnings and advisory messages relating thereto when issued and repeated at two hour intervals until midnight period time used is seventy fifth meridian time

15th—Following radio call letters assigned by Department of Commerce during week beginning July twenty fourth WJAG HUSE PUBLISHING CO NORFOLK DAILY NEWS NORFOLK NEBR WIAW SAGINAW RADIO AND ELECTRIC CO SAGINAW MICH WIAV NEWYORK RADIO LABORATORIES BINGHAMTON NY WJAK WHITE RADIO LABORATORY STOCKDALE OHIO KFBG FIRST PRESBYTERIAN CHURCH TACOMA WASH WHAM D M PERHAM CEDAR RAPIDS IOWA WKAA REPUBLICAN TIMES AND F H PAAR CEDAR RAPIDS IOWA WIAX CAPITOL RADIO CO LINCOLN NEBR

16th—ST AUGUSTINE FLA CALL LETTERS NAP TRANSMITS DAILY ON EIGHTEEN FIFTY ONE METERS WIND AND WEATHER FORECASTS AND STORM WARNINGS FOR EAST FLORIDA COAST JACKSONVILLE TO MIAI ADVISORY MESSAGES RELATING TO STORM WARNINGS ISSUED FOR MIDDLE AND SOUTH ATLANTIC AND EAST GULF COASTS AND EIGHT A M BAROMETRIC PRESSURE WIND DIRECTION AND VELOCITY AND STATE OF WEATHER AT JACKSONVILLE AND TITUSVILLE AT ELEVEN THIRTY A M PERIOD STORM WARNINGS AND ADVICES ISSUED IN AFTERNOON AT SEVEN P M PERIOD HURRICANE WARNINGS AND ADVISORY MESSAGES RELATING THERETO WHEN ISSUED AND REPEATED AT TWO HOUR INTERVALS UNTIL MIDNIGHT PERIOD SEVENT FIFTH MERIDIAN TIME

17th—FOLLOWING ADDITIONAL CALL LETTERS ASSIGNED BY DEPARTMENT OF COMMERCE DURING THE WEEK BEGINNING JULY TWENTY FOURTH WIAS BURLINGTON HAWKEYE HOME ELECTRIC CO BURLINGTON IOWA WJAE TEXAS RADIO SYNDICATE SAN ANTONIO TEXAS KFAV COOKE AND CHAPMAN VENICE CAL KFAW THE RADIO DEN SANTA ANA CAL WIAT LOON T NOEL TARKIO MO WIAU AMERICAN TRUST AND SAVINGS BANK LE MARS IOWA WJAC REDELL CO JOPLIN MO WJAJ YMCA DAYTON OHIO

18th—MR FRANK S BATTERSON OF LEONIA N J MEMBER of the Boy Scouts of America and Radio Amateur Number thirty eight fifty four has been promoted to radio amateur number seven upon recommendation of Mr Armstrong Perry Sea Scout Radio Commodore and the Boy Scout Executives period register numbers one to one hundred of the Radio Amateur Bureau were reserved for Boy Scouts of America who

Dubilier Radio Products are good enough for Uncle Sam

DUBILIER condensers have long been the standard equipment of the United States army and navy, as well as of the apparatus made by the principal radio manufacturers.

Dubilier Micadons are little *receiving* condensers of *pressed mica,* and are made like the condensers ordered by Uncle Sam. They are permanent in capacity and, hence, reduce tube noises. The price ranges from 35 cents to $1.00 each, dependent on the type and the capacity.

No outside antennae
No indoor loop
Just the Ducon in a lamp socket

Radio Reception from Any Lamp Socket

The Dubilier Ducon does away with troublesome antennae and loops. Simply screw it in any lamp socket and the music, news and talks come in perfectly.

Price at your dealer, $1 50

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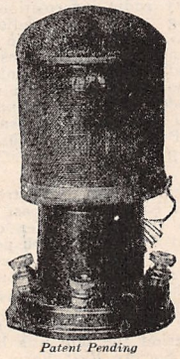
St. Louis, Mo.	Syndicate Trust Bldg., Suite 1409
Washington, D. C.	Munsey Building
Chicago, Ill.	53 West Jackson Blvd.
Atlanta, Ga.	802-3 Forsyth Bldg.

DUBILIER Condenser & Radio Corp.
48-50 West 4th St. N.Y.

Canadian Distributors—Canadian General Electric Company, Toronto, Can.

VAC-SHIELD



Patent Pending

Price $1

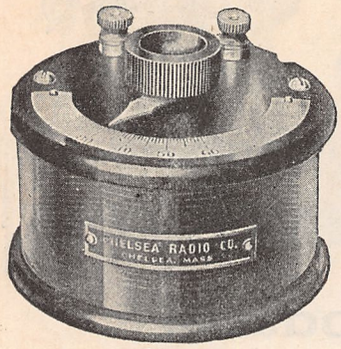
Not Like Rip Van Winkle—

We were awake to the possib lities for improvement in Radio and now announce a new device "THE VAC-SHIELD" a non-magnetic shield for your Detector and Amplifying Tubes. Your Tubes are the most delicate and sensitive part of your receiving instrument and should be protected with VAC-SHIELDS to guard against capacity effects. Your set should have them. Make reception worth while. Also guard your Tubes against breakage.

Specify your make of tubes when ordering. At your dealers or by mail.

ORANGE RESEARCH LABORATORIES
41 North 16th St. East Orange, N. J.

CHELSEA CONDENSERS



No. 1

PRICES

No. 1	Table	.001	$5.00
" 2	"	.0005	4.50
" 3	Panel	.001	4.75
" 3a	"	without dial..	4.35
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" 5a	"	without dial..	3.35
" 6	"	vernier	2.90
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" 7	"	with vernier..	6.50
" 8	Table	with vernier..	6.75

Genuine Bakelite Construction

The best and most complete line of condensers in existence.

Write for our Catalog No. 7

CHELSEA RADIO CO.
179 Spruce Street
CHELSEA, MASS.

High School Course in 2 Years

You can complete this simplified High School Course at home inside of two years. Meets all requirements for entrance to college and the leading professions. This and thirty-six other practical courses are described in our Free Bulletin. Send for it TODAY.

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Dept. H 985 Drexel Ave. & 58th St. CHICAGO

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SECOND HAND TIME CLOCKS
Bought, Sold, Repaired and Exchanged
ALL WORK GUARANTEED
We Carry a Full Line of Supplies
489 Broadway, near Grand St., Phone, Canal 7951

MARSHALL CONDENSERS
FULLY ASSEMBLED *or* READY TO BUILD
NEW HAVEN RADIO CO. Manufacturers, NEW HAVEN, Conn.

are recommended by the Scout Executives as having attained extraordinary qualifications in radio and performed meritorious radio service.

19th—Pensacola Fla call letters NAS sends wind and weather forecasts and storm warnings for Florida and Alabama coasts Appalachicola to Bay St. Louis advisory messages relating to storm warnings issued for south Atlantic and Gulf coasts and eight a m barometric pressure wind direction and velocity and state of weather at Pensacola at eleven forty five a m period storm warnings and advices issued in afternoon at six p m period hurricane warnings and advisory messages relating thereto when issued and repeated at two hour intervals until midnight period all times used are seventy fifth meridian

20th—New Orleans La call letters NAT transmits daily on eighteen thirty two meters wind and weather forecasts and storm warnings for Louisiana and Texas coasts Bay St Louis to Port Arthur advisory messages relating to storm warnings issued for south Atlantic and Gulf coasts and eight a m barometric pressure wind direction and velocity and state of weather at Burrwood and Port Arthur at eleven a m period storm warnings and advises issued in afternoon at five p m period hurricane warnings and advisory messages relating thereto when issued and repeated at two hour intervals until midnight period sends time at eleven fifty five a m

21st—Radio amateur bureau sends short messages of interest to every radio amateur every evening immediately following nine p m press schedule on eighteen thirty two meters followed by repetition on one hundred fifty meters period short messages in code are also sent occasionally key to which will be furnished by this Bureau upon becoming member

22d—St Petersburgh Fla call letters NGL transmits daily on twenty seven hundred meters wind and weather forecasts and storm warnings for West Florida coast Key West to Apalachicola advisory messages relating to storm warnings issued for the south Atlantic and Gulf coasts and eight a m barometric pressure wind direction and velocity and state of weather at Tampa and Key West at eleven thirty a m period storm warnings and advices issued in afternoon at seven p m period hurricane warnings and advisory messages relating thereto when issued and repeated at two hour intervals until midnight period all times used are seventy fifth meridian

23d—Radio Amateur Broadcast is now being transmitted on eighteen hundred thirty two meters after which it is repeated on one hundred fifty meters immediately after nine p m press schedule is completed.

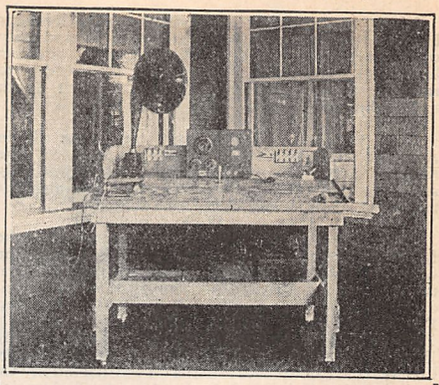
24th—New list of commercial and Government radio stations of the United States also containing broadcasting stations in operation June thirtieth comma experimental stations technical and training school stations and special amateur stations will be ready for distribution by Superintendent of Documents Government Printing Office Washington DC Price of this publication will be fifteen cents per copy

25th—On or about October fifteenth a new list of amateur radio stations will be ready for distribution period price of this book will be fifteen cents period list of experimental comma technical and training schools and special amateur stations will be included in this publication.

26th—Bureau of Standards has developed an amplifier which used sixty cycle alternating current to supply power for both filaments and plates period necessity for storage batteries and dry batteries thus eliminated period final form of amplifier uses five tubes and crystal detector there being three radio frequency stages and two audio frequency stages period discription of this amplifier is contained in paper by P D Bowell quote note on the development of an electron tube amplifier which uses sixty cycle alternating current to supply power for the filaments and plates unquote which appeared in July nineteen twenty two issue of Journal of American Institute of Electrical Engineers

27th—Bureau of Standards circular one twenty two sources of elementary radio information has been prepared containing elementary radio information regarding radio publications radio laws and regulations station and operator licenses and call books comma periodicals of radio interest comma lists of more important Government radio publications and radio books of general interest period may be procured by Superintendent of Documents Government Printing Office Washington DC for fifteen cents per copy

28th—A little girl suffering from spine trouble and who has been on her back for the past four months is grieving over the loss of her collie period the dog disappeared August fifteenth period answers to the name of Nero and has a collar and New York City license period anyone having knowledge of the dogs whereabouts will make the little girl happy by communicating with Mrs Jacob Ehrlich one thirty one West thirty sixth street New York City period the dog was being cared for by Horse Aid Society Rest Farm Milwood New York for summer as mother had to go to work to support child whose father was killed in the war



THIS TABLE MAKES YOUR RADIO CONVENIENT

PRICE IN KNOCK-DOWN FORM. COMPLETE WITH SCREWS AND CASTERS **$12.00**

An experienced wireless operator designed the IDEAL RADIO TABLE. Mount all your instruments on it, batteries charging outfit, loudspeaker. Have everything neat, compact, accessible, with the switches and controls at your hand. Take it anywhere on easy-rolling casters.

The IDEAL RADIO TABLE is furnished only in knock-down form; easily assembled from diagram. Accurately and neatly made of white pine and packed in a box. Shipping weight about 45 lbs. Size of table 24" wide x 36" high. Shipped immediately on receipt of price, $12, F. O. B. Milford, N. H. Specify choice of stain, Mission Brown, Mahogany, or in natural wood; also freight or express.

DEALERS—WRITE FOR WHOLESALE PRICES

G. B. SPRING CO., Inc.
MILFORD, NEW HAMPSHIRE

TEST YOUR BATTERY IN 15 SECONDS

Your "A" Battery was costly, yet you run a chance of ruining it every time you allow it to go dead or whenever the acid fails to cover the plates.

The success of an evening's entertainment depends upon the condition of your battery: test it every day, and see that it is fully charged and plates fully covered,

CHASLYN "Sink - or - Swim" Ball Battery Tester

Green-Lean
White-Right
Red-Dead

makes this the work of a moment.

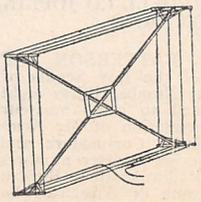
The *Depth-Guage* tells you how much acid you have; the *Ball Hydrometer* tells its condition, and the *Air-Controlled* Stopper makes it easy to add just enough distilled water.

Hydrometer contains three Balls of different specific gravities:
"Float all three—Charged fully
Sinks the *white*—Charge still *right*
Sinks the *green*—Charge is *lean*
Sinks the *red* —Charge is *dead*."

More accurate than the graduated scale hydrometer, and ten times as easy to read. Also saves your carpets and rugs from acid burns.

Order from your dealer. If he doesn't have it, send ONE DOLLAR and his name, and set of three parts, illustrated will be sent you postpaid.

CHASLYN COMPANY
4311 Kenmore Ave. Chicago, Ill.



It's easy, make your own
INDOOR COIL AERIAL

Drawing, R. F. amplifier circuit, chart and tables giving proper number of turns to put on coil for any wave length. Complete data covering 0 to 24,000 meters on three large sheets, $1.00. Stamps not accepted.

C. A. DAVIS & CO.
1410 Hamilton St., N. W., Wash., D. C.

29th—Department of Commerce has assigned the following call letters to stations during the two weeks beginning August seventh period WJAT KELLY VAWTER JEWELRY CO MARSHAL MO WJAU YANKTON COLLEGE YANKTON S D WJAW REINEMUND HARDWARE CO AUDUBON IOWA WJAX UNION TRUST CO CLEVELAND O W JAY IOWA STATE FAIR DES MOINES IOWA W J VIRGIN MILLING CO CENTRAL POINT OREGON

30th—Department of Commerce has assigned the following call letters to broadcasting stations KFBJ BOISE RADIO SUPPLY CO BOISE IDAHO KFBK KIMBALL UPSON CO SACRAMENTO CAL KFBL LEESE BROS EVERETT WASH KFBM COOK AND FOSTER ASTORIA ORE WJAZ CHICAGO RADIO LABORATORY CHICAGO ILL WKAF WDWIN T BRUSE LOUISVILLE KY

31st—It is requested that all members and other amateurs receiving radio amateur broadcast on one hundred fifty meters inform the Bureau of same stating location of receiving apparatus period the radio amateur broadcast is transmitted on one hundred fifty meters immediately after completion of its transmission on eighteen thirty two meters at approximately nine forty pm daily seventy fifth meridian or Eastern standard time

NAVY MESSAGES FOR AMATEURS DURING SEPTEMBER, 1922

1st—Code two—Radio Amateur Bureau is prepared to furnish members instruction and advice concerning the purchase of radio receiving sets comma manufacture of home-made receiving sets and improvement of the sets which members now have.

2d—English—The Radio Amateur Bureau desires to hear from all members and other radio amateurs who are copying radio amateur broadcast at distances greater than one hundred miles.

5th—English—Many requests are received from Radio Amateurs who desire to become members of the Radio Amateur Bureau but who forget to give their complete addresses when making application or sending for information period such requests cannot be answered and the Bureau is taking this means of notifying those whose applications have not been answered of the reason for such apparent neglect.

7th—English—Radio Amateur Bureau will answer all questions of a technical or practical nature pertaining to radio that are submitted by its members period applications for membership should be addressed Radio Amateur Bureau Third Naval District South and Whitehall Streets New York City.

8th—English—All radio amateurs having receiving sets or transmitting sets who are desirous of improving their knowledge in radio telegraphy are eligible to apply for membership in the Radio Amateur Bureau.

11th—English—Application for membership in radio amateur bureau from Donald B. Harriott and Maurice Cathey received without addresses period applications for membership in Radio Amateur Bureau must be accompanied by addresses in full or we will be unable to send registration forms and code charts.

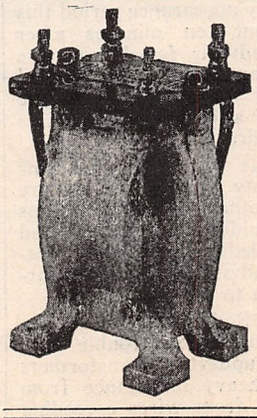
13th—English—results of the International six meter yacht race held off Oyster Bay Long Island Sound are being transmitted to this station by a press representative on board a Naval vessel stationed at the course period the vessel transmits on fourteen thirty meters spark beginning in the early afternoon and sends notes of interest along as the race progresses period while the results of the race may be copied by any amateur it is not desired that he disclose the contents of any bulletin.

14th—English—Department of Commerce has assigned the following call letters to new broadcasting stations period WLAM Morrow Radio Co Springfield Ohio WLAO Anthracite Radio Shop Scranton Penn KFCD Salem Electric Co Salem Oregon WLAW Police Dept City of New York New York NY WLAK Vermont Farm Machine Corpn Bellows Falls Vt WLAN Putnam Hardward Co Houlton Maine WMAF Round Hills Radio Corpn Dartmouth Mass

The day in and day out efficiency of this inexpensive De Forest Radiohome Receiver with its range up to 100 miles is just a straw that shows which way the wind blows. Anything marked DeForest lives up to the reputation of that great name.

DE FOREST RADIO TEL. & TEL. CO.

JERSEY CITY, N. J.



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PERFECTION PRODUCTS

Seco Audio-frequency Transformer is a highest grade instrument, heavily shielded in special Aluminum Alloy Case against eddy currents. Noiseless. Highest efficiency. Lowest "B" battery power required
SECO type A.F. 500 (enclosed). List Price $6.50
SECO type A.F. 501 (open). List Price $5.50
SECO type A.F. 502 (unmounted). List Price.....$5.00

SECO 2200 Ohm HEAD SET
A receiver set designed and built to obtain maximum clarity and volume of tone without sacrifice of either quality. The result is a sweeter toned receiver than other makes.
SECO 2200 ohm Head Set. List Pr.$8.00
Prices postpaid U. S. and Canada.

Scientific Equipment Co.
Ridgewood, N. J.

WANTED—Back numbers of Radio News, Sept., Oct., Nov. and Dec., 1921, Jan. and Feb., 1922. Experimenter Publishing Co., 53 Park Place, New York City

SUPREME

for low-voltage tubes

The Storage Battery Magno is ideal for the new low-voltage tubes. It is the most economical battery made—costing much less than dry cells to operate.

The Magno is recharged by unscrewing cover and inserting "spare" electrode. "Spares" are exchangeable at your dealers or direct from our factory at 25¢ each. Thus you can completely recharge your Magno almost instantly obtaining with this 25¢ spare the equivalent of 4 dry cells. Keep a spare charge on hand and your concert will never be interrupted. Learn more about this remarkable storage battery.

Write today for descriptive folder R-1-12

Dealers write for lists.

"Every Battery Its Own Service Station"

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STORAGE BATTERY MAGNO

CANADIAN RADIO MANUFACTURERS AND JOBBERS

We can supply your requirements in Variable Condensers, Rheostats, V. T. Sockets, Telephone Jacks, Plugs, Binding Posts and other Radio Accessories. We are equipped to manufacture Radio Parts to your design. Send us your enquiries and let us quote prices.

RUSSELL GEAR & MACHINE CO., LIMITED
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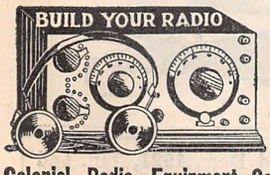
Manufacturers of
Automobile Transmissions and Gears, Phonograph Motors, Stampings and Screw Machine Parts of all descriptions.



Save Money
Build Your Own At Home

Complete Standard Parts for Long Distance Radio Outfits. We do all machine work; you do the hand work; we tell you how. Immediate delivery. **Also complete Radio Sets —all sizes at bargain prices.** Write now for our big bargain catalog.

Colonial Radio Equipment Co., 4759 Calumet Avenue Dept 11, Chicago, Ill.

15th—English—Department of Commerce has assigned the following call letters to new broadcasting and commercial land stations period WMAH General Supply Co Lincoln Nebr WMAM Beaumont Radio Equipment Co Beaumont Texas WMAD Atchison County Mail Rock Port Mo WKAX WM A Macfarlane Bridgeport Conn WKK Bureau of Insular Telegraph Ceiba P R WGW Bureau of Insular Telegraph Vieques P R KFBQ Savage Electric Co Prescott Ariz WFCB Neilsen Radio Supply Co Phoenix Ariz KFCC Auto Supply Co Wallace Idaho

17th—English—Department of Commerce has assigned the following call letters to new broadcasting stations WKAM Hastings Daily Tribune Hastings Nebraska WKAP Dutee W Flint Cranston R I WKAQ Radio Corpn of Porto Rico San Juan P R KFBN Borch Radio Corpn California comma Portable comma WLAF Johnson Radio Co Lincoln Nebr WKAR Michigan Agriculture College East Lansing Michigan

18th—English—Department of Commerce has assigned call letters to the following broadcasting stations WKAH Planet Radio Co West Palm Beach Fla WKAJ Fargo Plumbing and Heating Co Fargo N Dak WKAK Okfuskee County News Okemak Oklahoma WLAD Arvanette Radio Supply Co Hastings Nebraska WKAN Alabama Radio Mfg Co Montgomery Ala WKAL Gray and Gray Orange Texas

19th—English—International Bureau of the Telegraph Union Berne Switzerland advises that they will publish a new edition of the Alphabetical list of call letters seventh edition period Price of this document and subscription with supplements for nineteen twenty two and nineteen twenty three is six francs Swiss postage included period persons desiring to receive this list should forward the price in Swiss Francs to the Berne Bureau

20th—English—New list of commercial and government radio stations of the United States will be ready for distribution some time during the present month unless something unforeseen should delay its publication period price will be about fifteen cents per copy but no definite price can be set at this time period list of amateur radio stations of the United States will probably cost at least twenty five cents per copy due to increased size of the list period this list will not be ready for distribution until some time in October period when it is definitely known when these publications are ready for distribution and the price determined notice will be broadcasted

21st—English—At twelve forty a m July twenty fourth nineteen twenty two latitude fifty two twenty nine north longitude thirty two zero one west SS WHEELING reports that during heavy rain squalls accompanied by heat lightning the port wire of the radio aerial was illuminated for its entire length with a glowing white light which gave the wire a fuzzy appearance period this continued for about ten minutes after which the light gradually faded from the ends of the wire and finally disappeared from the center of the aerial period the compasses were not affected period this is known as st Elmos fire

22nd—Whereabouts of J Ray Atkins radio operator twenty three years old are requested by his mother Mrs. J R Atkins box two five three midlothian Texas period anyone having knowledge of this mans present address should advise this office or furnish the information to his mother

23rd—The Naval Radio compass service has experienced considerable trouble with audio frequency amplifying transformers burning out from heavy inductance from lightning storms or from wires corroding due to dampness period it is believed the only remedy is to properly safeguard the receiving set during lightning storms and

Antenella

(No Antenna or Aerial Needed)

Does away entirely with antenna and all outside wiring, lightning arresters, switches and all other inconveniences.

ANTENELLA enables you to enjoy Radio pleasures in any room in your house. Place your receiving set anywhere and merely attach Antenella to any electric light socket. No current consumed.

At your dealer's—$2.00

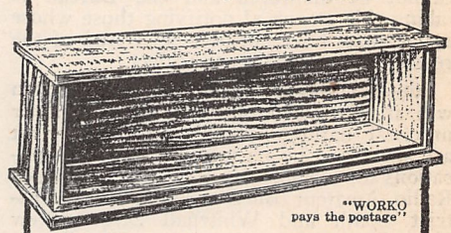
If he can't supply you send purchase price and you will be supplied promptly without further charge.

CHAS. FRESHMAN COMPANY, Inc.
290 Hudson Street New York City

WORKO

Radio Cabinets

Built your own receiving set. Worko Cabinets finest solid Mohogany. Fronts rabbeted. Tops hinged. Beautiful brown finish — hand-rubbed. Order today for quick delivery. Check or M. O. *Prepaid East of Rockies.*



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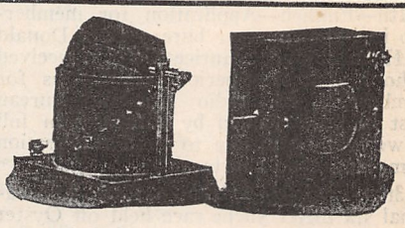
Panel Size	Dimensions	Price Ea.
6 x 7″	5½ x 6½ x 7″ deep	$2.40
6 x 10½″	5½ x 10 x 7″ "	2.65
6 x 14″	5½ x 13½ x 7″ "	3.10
6 x 21″	5½ x 20½ x 7″ "	3.95

Worko Co. Dept. R. Racine, Wis.



Variometers } $3.00
Variocouplers } each

Variotuners $5.50

Wave Length 150-1600 Meters

Completely Assembled and Guaranteed

SEND FOR BULLETIN

FREDERICK WINKLER, Jr.
304 Columbus Ave., New York, N. Y.

ARE YOU SELF-CONSCIOUS?

Embarrassed in company, lacking in self-control? Let me tell you how you can overcome these troubles.

M. VERITAS, 1400 Broadway, New York City

keep the amplifying transformers in a dry place or use only the airtight enclosed type period the Navy radio compass receivers are used continuously during electric storms and therefore it is impossible to safeguard amplifying transformers against lightning except by the use of gap type of lightning arrester

25th—English—W A Marsh of Miami Florida radio amateur number four three nine seven visited radio amateur bureau this date for latest information regarding bureaus activities period he has purchased a Grebe CR nine receiver in New York which he is taking home with him for the purpose of receiving the daily radio amateur broadcast during the summer months as well as winter months

26th—Code two—USS Maryland broke all records on her last trip from Rio de Janeiro to New York making the trip in ten days sixteen hours and ten minutes period this beats best previous time by approximately five and one half hours period Secretary of State returned on USS Maryland from Brazil where he attended the opening of exposition celebrating centenary of republic of Brazil.

27th—English—Department of Commerce has assigned the following new call letters to broadcasting stations during the past week period WLAS Hutchinson Grain Radio Co Hutchinson Kans WMAG Tucker Electric Co Liberal Kans KFBS Trinidad Electric and Supply Co Trinidad Colo WLAX Putnam Electric Co Greencastle Ind WMAK Norton Laboratories Lockport NY WOAW Midland College Fremont Nebr WPAN Levy Bros Dry Goods Co Houston Tex WMAN Broad St Baptist Church Columbus Ohio

29th—Code 4—A continuous howling in the receiving phones of a regenerative receiver indicates an open circuit which may generally be found in rheostats comma connection flexible leads or primary or secondary of audio frequency transformers

30th—Code 6—In three months time the average beginner can attain an operating speed of twenty words in the continental morse code by applying two hours per day to faithful practice with an omnigraph or phonograph record and a key buzzer and battery connected in circuit

NEW BROADCASTERS LICENSED

There were but three broadcasting stations licensed during one week recently: a cathedral in Boise, a college in Springfield, Ohio, and a city in California:

KFDD—St. Michaels Cathedral, Boise, Idaho.

WNAP—Whittenberg College, Springfield, Ohio.

KFEB—The City of Taft, California.

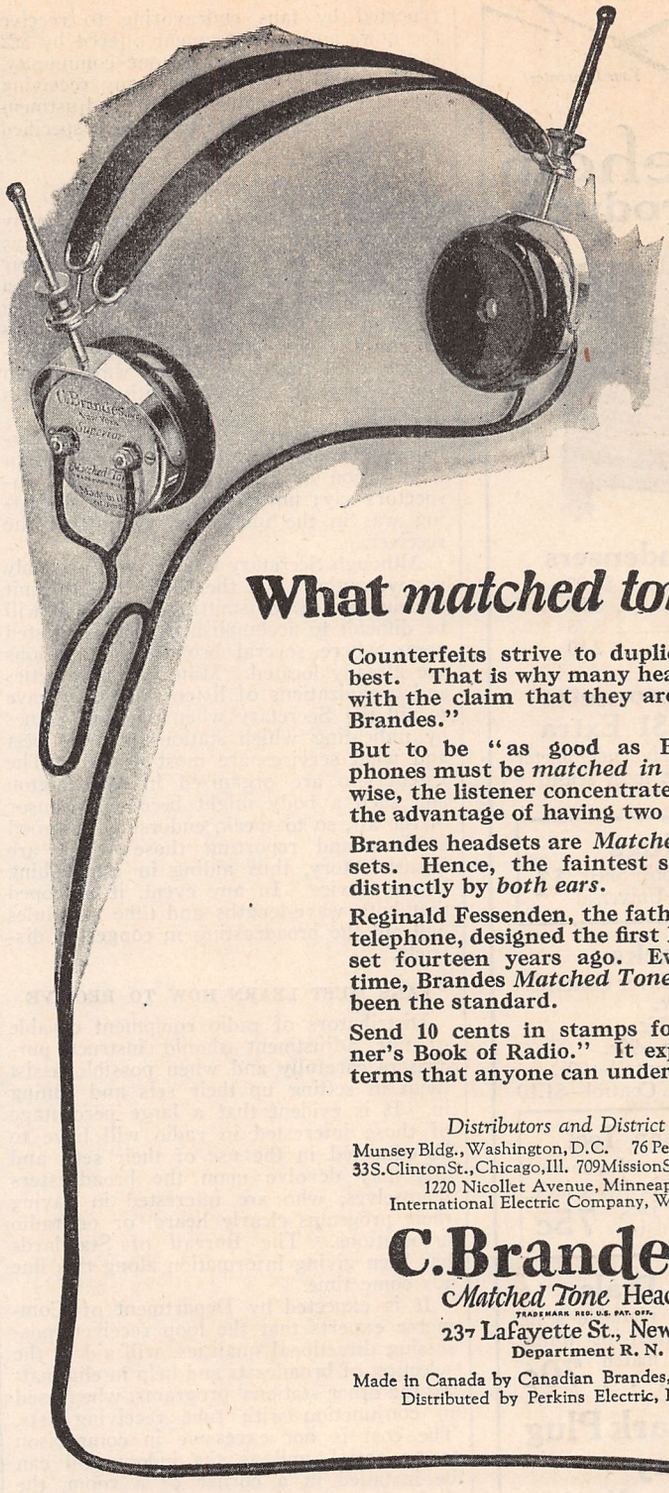
LIMITATIONS OF RADIO BILL—PUBLIC EDUCATION IN RADIO NEEDED

By Washington Radio News Service

Congressman White of Maine, father of the Radio Bill, calculated to improve radio in this country commercially, in broadcasting and for amateurs, has returned to the Capital and believes that the bill will be taken up by his committee early in December.

The enactment of this long-looked-for legislation will benefit all branches of radio, but officials of the Department of Commerce say that it will not entirely eliminate interference in broadcasting. There are some features in connection with radio which cannot be corrected by legislation, it is pointed out by experts of the Government, such as the mastering of one's own set.

Even if there were enough waves to give each station an exclusive band, and there are not nearly enough, interference would still be encountered or at least



What *matched tone* means

Counterfeits strive to duplicate only the best. That is why many headsets are sold with the claim that they are "as good as Brandes."

But to be "as good as Brandes," the phones must be *matched in tone*. Otherwise, the listener concentrates on one, and the advantage of having two is lost.

Brandes headsets are *Matched Tone* headsets. Hence, the faintest sound is heard distinctly by *both ears*.

Reginald Fessenden, the father of the radio telephone, designed the first Brandes headset fourteen years ago. Ever since that time, Brandes *Matched Tone* headsets have been the standard.

Send 10 cents in stamps for the "Beginner's Book of Radio." It explains radio in terms that anyone can understand.

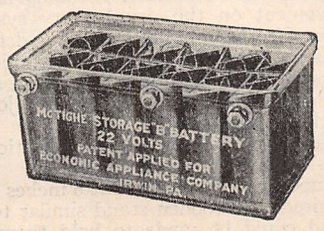
Distributors and District Offices:
Munsey Bldg., Washington, D.C. 76 Pearl St., Boston, Mass.
33 S. Clinton St., Chicago, Ill. 709 Mission St., San Francisco, Cal.
1220 Nicollet Avenue, Minneapolis, Minn.
International Electric Company, Wellington, N. Z.

C. Brandes, INC.
Matched Tone Headsets
TRADEMARK REG. U.S. PAT. OFF.
237 Lafayette St., New York
Department R. N.

Made in Canada by Canadian Brandes, Ltd., Toronto and Distributed by Perkins Electric, Ltd., Montreal

RESULT OF 14 YEARS EXPERIENCE

McTIGHE ALKALINE STORAGE "B" BATTERY
for RADIO OUTFITS



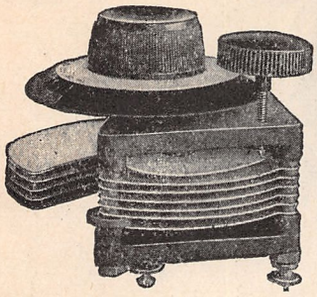
The McTighe Storage "B" Battery is the most satisfactory for radio use. It gives 22 volts, is inexpensive—noiseless—cannot be damaged by short circuit, overcharging, standing idle or uncharged. Can be fully charged from any light socket for less than one cent. Is furnished in an oblong glass container which nests neatly.
The McTighe Rectifier is cheap, simple, durable, and effective, and should be used when charging the McTighe "B" Battery.

Battery, $5.00. Rectifier, $1.50. Rubber Filler, 25c.
F. O. B. Irwin, Pa.
Discount to Dealers. Prompt shipments.

ECONOMIC APPLIANCE CO.
IRWIN, PENNA.

This Mark Is B Your Guarantee

bethlehem Radio Products



Variable Condensers

.001 M. F.	$4.00
.0006 M. F.	3.50
.0003 M. F.	3.25
3-pl. Vernier	2.50

Sensitive Micrometer Adjustment $1 Extra

The Bethlehem exclusive micrometer adjustment is by far the most sensitive on the market.

Radio Plugs

Round Type, Hard Rubber Shell AX1–Standard, AX2–Universal **$1**

Radio Jacks

Brass Frame, Sterling Silver Contacts

BX1—Open Circuit—60c.
BX2—Closed Circuit—75c.
BX3—Double Circuit—90c.
BX4—Single Fil. Control—90c.
BX5—Double Fil. Control—$1.10

Radio Installation Tool

Indispensable in many Radio assembly operations, such as fitting jack bushings and adjusting jack springs and condenser plates **75c**

Bethlehem Dials

Made of brass, with readable scale etched in metal and filled in white. Finished in black to match highly-polished knob **70c**

Bethlehem Spark Plug Company

Bethlehem, Pennsylvania

An Opportunity

For Radio Set Manufacturers

2500 Genuine $7.50

Stromberg-Carlson

2-C RADIO HEAD SETS

Bearing Prominent Manufacturer's Name

Offered At Considerably Under Manufacturers' Best Prices

Address **F. FITCH**

129 Sussex Avenue - - NEWARK. N. J.

Home-made Radiophone

Anyone can build a perfect receiving set for about $6.00 and hear the music and voice broadcasting talked about so much. Write for particulars.

204 Federal Institute Washington, D. C.

reported by fans endeavoring to receive the news and entertainment offered by 522 stations, many of them in one community. This would be so because many receiving sets are not capable of fine adjustment and cannot be properly tuned to a specified wave length.

GOOD SETS BADLY TUNED

In spite of possessing excellent sets, many enthusiasts are not able to tune properly; they do not know how to manipulate their sets and eliminate interference within a prescribed band. Already reports have been received by the Department that broadcasting on the new 400-meter wave is interfering with that on the 360 wave, which should not be the case with 40 meters between.

If transmission is good, first-class receiving sets should be capable of tuning within a variation of from 5 to 10 meters, inspectors say; unless one station broadcasting was in the immediate vicinity of the receiver.

Although Secretary Hoover will probably receive authority in the Radio Bill to limit the number of transmitting stations, it will be difficult to accomplish this in congested areas where several broadcasting stations are already located. Municipal authorities and organizations of listeners-in may have to aid the Secretary when the time comes by indicating which stations are the best and what services are most desired. The listeners-in are organized in Washington and such a body might become a censor of the air, so to speak, endorsing the good stations and reporting those which are unsatisfactory, thus aiding in establishing better service. In any event, it is hoped that both wave-lengths and time schedules will aid the broadcasting in congested districts.

FANS MUST LEARN HOW TO RECEIVE

Distributors of radio equipment capable of fine adjustment should instruct purchasers carefully and when possible assist them in setting up their sets and tuning in. It is evident that a large percentage of those interested in radio will have to be educated in the use of their sets, and this may devolve upon the broadcasters themselves, who are interested in having their programs clearly heard, or on radio associations. The Bureau of Standards has been giving information along this line for some time.

It is expected by Department of Commerce experts that the loop receiver, possessing directional qualities, will aid in the selection of broadcasts and help in eliminating the other stations' programs, when used in conjunction with tube receiving sets. The cost is not excessive in comparison to an aerial, and as the indoor coil can be installed in a corner of a room, the disfiguring overhead aerial may eventually disappear from housetops. It is part of the question of experimentation and education in radio.

A CONSTANT H. T. BATTERY FOR WIRELESS

By L. C. Krailing

IN previous issues articles were published, on cheap "B" batteries. Although an improvement on the dry battery system, this type of battery had the following defects:—It was not constant and polarized quickly. It necessitated buying torch batteries at some time or other. It was a troublesome job to obtain the porous "pots."

The following battery is a modification of the well-known Gravity Daniel Cell.

A number of test tubes about 6 inches high are required. A wooden stand similar to an egg-stand could be made to hold them, or they may be strung together by wire.

Cut off from a length of No. 20 B.S. bare

FRAMINGHAM

The Rheostat with the *Panel Bushing*

New price is 75 cts

At Your Dealer's

Three hundred thousand Framinghams were sold last year to satisfied customers. Quantity production has reduced the cost. The saving is passed along to you in the new price of seventy-five cents.

SHIP OWNERS RADIO SERVICE INC.

80 Washington Street, New York

Wholesale Distributors

SORSINC BRANCHES:

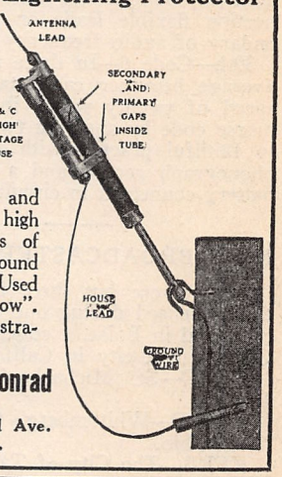
Boston, 46 Cornhill St. San Francisco, 591 Mission St.
Baltimore, 11 N. Eutaw St. Chicago, 538 So. Dearborn St.
New Orleans, 740 Union St. Seattle, 67 Columbia St.

EVERY RADIO SET

should have this protective device in the house lead if an outside antenna is used. The

S&C Radio Lightning Protector

eliminates all danger from lightning or crosses with high voltage power circuits. Installed outdoors and never fails to intercept and keep outdoors high potential currents of any nature. No ground switch required. Used by people who "know". Write for free illustrated circular.



Schweitzer & Conrad INC.

4437 Ravenswood Ave. Chicago, Ill.

1000 Miles *for $15*

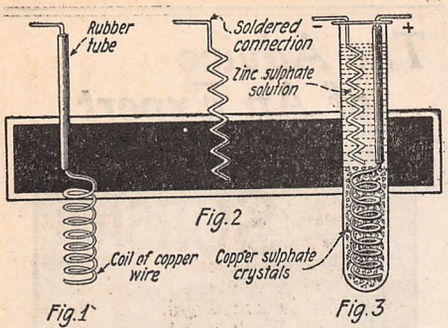
The New Haynes Circuit combines extreme simplicity, ultra-sensitiveness and great selectivity; the three prime requisites for the ideal radio receiver.

We have prepared a paper giving detailed working diagrams, cuts, and explicit instructions for constructing a set of this type, the cost of which does not exceed $15.

It will be mailed to you upon receipt of 50 cents (no stamps)

HAYNES RADIO CO. Inc.

629 Lexington Ave., New York City



A New Type of "B" Battery Cell Which May Be Recharged, and Is Easy to Construct.

copper wire, a piece about a foot long. Twist about half of this wire into the form of a coil (Fig. 1). Insulate the straight piece of wire with a rubber tube. (A bicycle valve-rubber will do for this.) Bend a piece of sheet zinc 1/32 inch thick into the form shown in Fig. 2. Solder a small connecting wire to the top. Place the wire and zinc into the tube as shown in Fig. 3. Fill the tube half-way with a solution of zinc-sulphate, and then put in enough copper-sulphate crystals to cover the coil of wire.

This cell will give about one volt, but the current will remain constant for a very long time. About thirty test tubes will be required to work most valves.—Abstract from *The Model Engineer and Electrician.*

"SOME SET" IS RIGHT!

FOR SALE—Regenerative Receiving Set and Two-Step Amplifier. It consists of *Varo* Coupler, *Loaching* Coil and Tickler, 23-plate Condenser, *Potenseometer*, Plug for Phones, Socket, Bulb, Rheostat; it sets in Cabinet, 8 inches high, 20 inch long, 6 inches wide, with bakelite dials and panels. *This is some set. Phones include batteries, bulbs and sets.* The Amplifier is in separate cabinet, 8 inches high, 6 inches wide, 7 inches long. This is a bargain at *$175.00.* See the set at 1728 Lawrence street.

Advertisement in "Midwest Broadcaster."

PARK RECEIVING STATIONS

WIAY, Woodward and Lothrop's, a popular broadcasting station of Washington, has expanded its service to the public by installing loud speakers in several of the Capital's parks. Hundreds of people gather weekly to listen to Saturday night concerts. Entertainment by Radio is thus furnished to many people who do not have receiving sets, and has the advantage of keeping them out in the air while the radio service is on.

Stealing Call Letters.

(*Continued from page* 1075)

that the writers worked this party, while many are just "Sigs Heard." I have heard this station at the real 3BV and at that point he rolls in very QSA. Anyone hearing this station and getting me a QRA would be doing me a great favor.

PAUL G. WATSON,
214 W. Barnard St., West Chester, Pa.

Arcs

(*Continued from page* 1073)

In the Federal sets the aerial to ground capacity is considered as the condenser, and the loading inductance is considered as the inductance. Due to transformer action in the concentrated inductance coil the voltage at the upper, or antenna, end of the coil may reach as high as 20,000 volts when an antenna of .001 Mfd. capacity is used.

To quote the Federal Company further—"An arc transmitter consists of the following main units:

A Complete Line of Quality

Manufactured by one of the oldest radio firms in the U. S.

We did not spring up over night. More than 2,000 naval and commercial vessels are equipped with Radio Apparatus built in our factory. The same engineering skill and factory facilities which were required for the production of this professional apparatus are now being used in the production of high-grade Popular Radio Equipment.

Buy only from dealers who can and will give Radio Service.

After January first, authorized K & C Dealers will be known by a distinctive K & C "KUALITY" SIGN. Only those dealers whom we feel are capable and willing to give the kind of service we wish you to have will display that sign. When you buy from these dealers you will know that not only the dealer himself, but also the plant manufacturing the goods stands squarely behind our products.

KUALITY **COMPLETENESS**

LOOK FOR THIS K & C TRADE MARK

Some of our distinctive products

K & C Receiving Units
K & C Amplifying Units
K & C Crystal Receivers
K & C Head Telephones
K & C Variable Condensers
K & C Vernier Condensers
K & C Rheostats
K & C Vernier Rheostats
K & C Cabinets
K & C Panel Switches
K & C Tube Sockets
K & C Potentiometers
K & C Telephone Jacks
K & C Telephone Plugs
K & C Audio Frequency Transformers
K & C Radio Frequency Transformers
K & C Variocouplers
K & C Variometers
K & C Loud Speakers

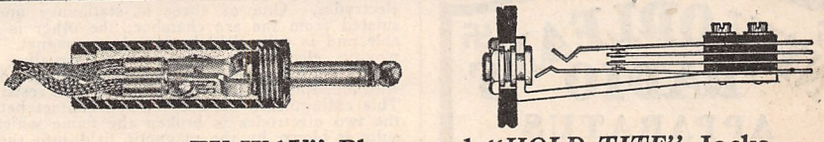
Write for "THE KILOGRAM," our monthly bulletin. It will be sent you FREE.

KILBOURNE & CLARK MFG. CO.

Electrical Engineers and Manufacturers

COMMERCIAL and GOVERNMENT RADIO APPARATUS

Head Offices and Works: 101 SPOKANE STREET
SEATTLE, U. S. A.



Carter *"TU-WAY"* Plugs and *"HOLD-TITE"* Jacks

The Carter *"TU-WAY"* Plug permits TWO phone sets to be connected. Takes ALL types of tip cord terminals or wires. Non-breakable one-piece handle not affected by body capacity; no screws used to hold handle. Price, $1.50 each.

The Carter *"HOLD-TITE"* Jack eliminates usual insulation stack-up between frame and springs. Wide spaced terminals; heavy tapered phosphor bronze springs; heavy pure silver self-cleaning contacts. No spacer washers. 1 to 5 springs. Prices, 70c to $1.10.

Sold by all good electrical and radio jobbers. Write for Bulletin on these and other Carter Products.

CARTER RADIO CO. 209 S. State Street CHICAGO

Insure your copy reaching you each month. Subscribe to Radio News--$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

Q S T

RADIO FANS
Perfection in Radio Headsets attained in "ECHO HEADSETS"

give clear distinct tones, reproduces perfectly, the most sensitive radio signals in music, speech and code.

No matter how perfect or expensive your apparatus; no matter how strong or perfect the wave; without **"ECHO HEADSETS"** your results cannot be perfect. We ship phones the day your order arrives. Every pair tested, matched and guaranteed as sensitive as the most expensive headsets made. **Sold with money-back guarantee.** *Sent C. O. D. by express, who will hold money for 48-hour trial, if not satisfied express company will return money.*

S. PEARSON RADIO CO.
142 Maple Street
Richmond Hill, L. I.

NEW ORLEANS RADIO
APPARATUS and SUPPLIES
ROSE RADIO SUPPLY
129 Camp St., New Orleans, La.
Send 10c for Latest Catalog

"IMPROVED" RADIO PRODUCTS
RADIO IMPROVEMENT COMPANY
29 West 35th Street New York

"1—A source of direct current of suitable voltage.

"2—An arc converter.

"3—An antenna loading inductance.

"4—An antenna and ground system.

"5—A signaling device.

"6—Auxiliary and control apparatus.

"The arc converts the power supplied by the direct current generator into radio frequency energy with undamped current in the antenna circuit. The antenna circuit consists of the antenna itself, the loading inductance, the electrodes of the arc, and the ground. The choke coil prevents the flow of radio frequency current from the arc back into the power machinery and serves to steady the arc itself. The frequency of the undamped current in the antenna circuit depends upon the inductance and capacitance of this circuit. The frequency, and therefore the wave-length, may be altered by changing the value of either the inductance or the capacitance, or both. Since (in practice) the capacitance is furnished by the antenna, and is therefore fixed, the inductance of the circuit is varied in making changes of wave-length. This is accomplished by changing the connections to the antenna loading inductance."

A simple circuit is shown in Fig. 2.

In actual operation the length of the arc flame is adjusted to secure maximum antenna current for the power used. The carbon (negative) electrode may either build up or burn down, depending on the composition of the gas in the chamber. When alcohol is used to supply the hydrogen gas the carbon usually burns as in Fig. 3. When kerosene is used the carbon builds up as in Fig. 4. Kerosene gives good results, especially on the shorter wave-lengths, but on account of the excessive soot given off, which dirties the chamber so badly, it is only used in an emergency, that is when no alcohol is available.

There are four main methods of signaling: 1—The "back-shunt"; 2—The coupled compensation loop; 3—The ignition key; or 4—By means of a chopper used together with either of the other three named. The chopper is only used on the shorter waves, say up to 1,000 meters, when it is desired to communicate with a station using a plain audion or a crystal detector. The wave produced with the chopper is called "interrupted undamped" or ICW.

The back-shunt method of signaling was described in Radio News recently by Mr. Daggett, and there is no necessity for repeating it here.

The coupled compensation method consists of a single turn of high-frequency cable placed in close inductive relation to the lower end of the loading inductance. When this loop is shorted by a telegraph key, the effective inductance of the loading inductor is reduced, thus reducing the wave-length. The receiving station must tune so as to hear only the shorter wave-length, since this is the one used to transmit signals, while the higher wave-length is commonly called the "back wave" or the compensating wave. When the compensating loop is closed the antenna is robbed of a small amount of current, but on one ship this loss amounted to 2 amperes on a 2 K.W. set; therefore, this method is supposed to be used only when the "back shunt" or "ignition" methods fail for any reason.

Quoting the Federal Company regarding signaling with a chopper, we read that "The frequency of the wave radiated by an arc radio transmitter is greater than can be heard by the human ear. In transmitting to a station which is receiving with a detector (meaning plain audion or crystal) it is therefore necessary to break up the radiated energy into wave trains of an audible frequency. This is accomplished by the chopper, which consists of a commutator wheel driven by a small motor." (This wheel is connected in series with the compensating loop.) "The chopper wheel, when rotated, opens and short circuits the coupled compensating loop at a speed which gives a musical note in the receiver. The radio frequency energy is thus emitted at two wave-lengths, as when using the key, but in this case the wave-length rapidly alternates between the two waves. A continuous musical note is thus produced.

Fig. 5 "shows the main circuits employed for the 'ignition key' method of signaling. In addition to the usual carbon and copper electrodes of the arc, there are within the chamber two auxiliary electrodes. One of these is stationary and insulated from the arc chamber; the other is movable and is controlled by an electromagnet. This moving electrode serves as the signaling key. When the two auxiliary electrodes are in contact with one another the arc is shunted by a resistance. This extinguishes the arc. When contact between the two electrodes is broken the flame which results is blown by the magnetic field into the gap between the two main electrodes of the arc. This flame causes the arc to be re-ignited. The arc then oscillates upon the antenna circuit just as though no auxiliary electrodes were present. Signaling is therefore accomplished by moving the ignition key electrode in and out in accordance with dots and dashes. The movement of the electrode is controlled through a Morse hand key by the electromagnet and a spring. The spring holds the electrodes closed and the electromagnet causes them to be opened whenever the Morse hand key is pressed to make a signal. Current is allowed in the antenna circuit only in accordance with dots and dashes. The power-absorbing resistor is adjusted so that the direct current output of the generator remains constant whether the arc is operating on the antenna or is extinguished." This adjustment is very important to secure steady operation of the arc."

The Advice of An Expert

THIS sign on the clean plateglass window of a radio shop means that a competent radio expert is in charge within, who will gladly give you the benefit of his broad experience, in selecting just the radio equipment to suit your purse and purpose.

"It Pays to Buy at the Sorsinc Store"

Mr. Dealer:—If you are a progressive merchant, you may display the Sorsinc sign. Let us tell you how.

Ship Owners Radio Service, Inc.
WHOLESALE DISTRIBUTORS
80 Washington St. New York

SORSINC BRANCHES:
Boston, 46 Cornhill St. San Francisco, 591 Mission St.
Baltimore, 11 N. Eutaw St. Chicago, 538 So. Dearborn St.
New Orleans, 740 Union St. Seattle, 67 Columbia St.

Radio Sets and Parts

We manufacture sets and carry a large stock of all well known sets, such as Westinghouse, Clap Eastman, DeForrest, Grebe, G E, Etc.

We also carry a complete stock of Magnavox, Head Sets, and Parts, and supplies of all kinds.

Our prices are lowest, as we have a very low overhead expense. Send for our RADIO CATALOG.

Washington Automobile Supply Co.
Established in 1908
WASHINGTON ILLINOIS

The "Q. S. A." Line of Radio Equipment

Are you being handed the inferior radio equipment now flooding the market? Long before the present boom "Q. S. A." equipment was well known to the amateur trade. Ask anyone of the old time amateurs and he'll tell you. Your only guarantee against inferior goods is to order from the "Q. S. A." catalog which will be sent for 10 cents in stamps or free with order from this ad. Below are some items not shown in our catalog but on which we can give you the same prompt service.

Fixed Receiving Condenser .001 mfd.	$ .70
Vacuum Tube Socket, composition	.75
3-inch Bakelite Dial and Knob	.85
Sw. Lever Set, consisting of 1 Sw. Lever, 14 contact points, 2 Sw. Stops, and 2 Binding Posts—a very good buy at only	1.00
Stay-Hot Soldering Iron, burns alcohol	2.00
Grewal "always adjusted" crystal detector	2.00
Howard Filament Rheostats	1.10
Brach Lightning Arrester	2.50
11 Plate Variable Condenser	3.30
23 Plate Variable Condenser	4.25
Federal Jr. Crystal Set, Complete with Phones	25.00

INDEPENDENT RADIO SUPPLY CO.
3239 Ogden Avenue CHICAGO, ILL.
"A Radio Store with a Conscience"

HOW ABOUT VCT AND VCU?

Has anyone seen or heard Bill Payne lately? BP used to burn up the ether with VCE and NBD when he was on WWE. He got into some awful arguments with VCT for jumping over his head and putting stuff through to NBD and WSE on 600. If you get him on 450 some off night, tell Bill to keep away from Hamburg and that we will be glad to hear from him.

By the way, are VCT and VCU still hollering as much as ever about American ships working U. S. stations direct? And do they still insist on taking strings of messages from ships, charge them an additional six cents a word, and then relay the msgs. on 600 to VCS, jamming everybody and yelling about QRM? In most cases the ship could work VCS direct without any trouble. C.W. has solved this situation in most cases, but in the spark days we used to prepare for a fight every trip. The bedlam around that section was terrible. How is the situation now? Would be glad to hear from some of you transatlantic fellows with your opinions and experiences in handling traffic after passing VCE bound west.

New Antenna Has Ten Miles of Wire and Weighs Seven Tons

(*Continued from page* 1050)

this upstanding steel framework is of divided classification. Four of the towers are spaced on a rectangle 860 feet square, and the other two units in the framework are spaced laterally, 975 and 1,250 feet, measured on a longitudinal center-line.

The antenna proper is sustained in position by ⅝-inch plough steel triatic cables suspended between the towers. Each one of the three triatics or stays is insulated from the towers by double 72-inch porcelain strain insulators. The antenna connections are such that the triatic cable is normally at antenna potential. The wires of this electric reservoir are fixed to the outer end (southerly direction) of the stay. These wires extend through the special antenna-wire sheaves on the middle or north triatics. From this juncture they go to an anchor block and to the entering arrangement on the roof of the helix room. A turn buckle is available in each wire at the anchor block as a means of varying the tension of the wire. The auxiliary or supporting antenna, as differentiated from the main antenna, is comprised of two wires supported from the tower outriggers or projecting beam, forming an immense loop completely circumventing the mast enclosure. The auxiliary wires are insulated by 57½-inch single porcelain insulators at each tower.

Contemplating "if winter comes," with its attendant atmospheric conditions of snow and sleet, this newly-installed antenna system recognizes the law of self-preservation, if this figure of speech may be applied. Anyway, adequate provisions have been made for arresting the accumulation of sleet by the well-known method of applying heat. The antenna system in its entirety may be subjected to the sleet-melting process, or the main and auxiliary sections may be heated independently. The dissipation of the weight and obstruction of ice-forming particles is effected by "short-circuiting" the heating insulators during normal transmission of radio-telegraph messages. The wires from the triatics or stays are insulated for the melting of sleet by porcelain-disc suspension insulators. Seventy-eight heating insulators, all told, are employed; 58 of these are installed in the main portion of the electric-radiating system, while 20, including 18 transmitting insulators, are to be found in the auxiliary antenna.

The connections for dissipating the accumulating force or cumbersomeness of ice are in this fashion: The antenna proper is arranged to afford eight loops. Each pair of antenna

MULTIPLIES RADIO'S MARVELS

Any up-to-the-minute Radio Dealer will demonstrate this wonderful Horn on YOUR OWN SET. Tune in to your limit and judge the Music Master by what it delivers to your own ears.

Fits any set. No extra batteries, no extra current needed. Makes head-sets obsolete. A roomful—a theater full—can listen to any program and hear every cadence, every shading of music or speech, through the Music Master.

Fourteen-inch Aperture (*Home Model*) . . $35

Twenty-one inch Aperture (*Concert, Dancing, Etc.*) . $45

Tell us your dealer's name before you request this free test. Then we can make sure he has Music Master to show you.

MUSIC MASTER Radio AMPLIFIER

TRUE TONE AT LAST

Conquers

"Screech" and "Snarl" and "Howl"

And Makes Listening A JOY!

JOBBERS! DEALERS! Sample Music Master Horn shipped to responsible members of the Radio or Phonographic trade with FULL PRIVILEGE OF RETURN. Write for list prices and full details.

"GERACO" LINE

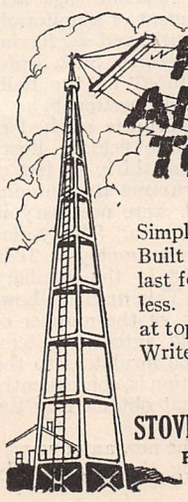
Everything worth selling in Radio Apparatus of TESTED merit. Ask for price lists. See the Geraco Phonographic Attachment. Makes any Victor or Columbia a LOUD SPEAKER for Radio receiving. Use it as sound-box. Only $10.00

THE GENERAL RADIO CORPORATION

Makers and Distributors of High-Grade Radio Apparatus

624, 628 MARKET STREET - - - - PHILADELPHIA

GERACO PROVEN RADIO PRODUCTS



RADIO ANTENNA TOWERS

Simple. Sturdy. Easy to erect. Built of galvanized steel. Will last for years. 100 ft. high or less. Fitted to take pipe mast at top. Immediate shipment. Write TODAY for prices.

Radio Department

STOVER MFG. & ENGINE CO.

FREEPORT, ILLINOIS

3000 Ohm Sets $3.98

PLUS 20 CENTS POSTAGE AND PACKING

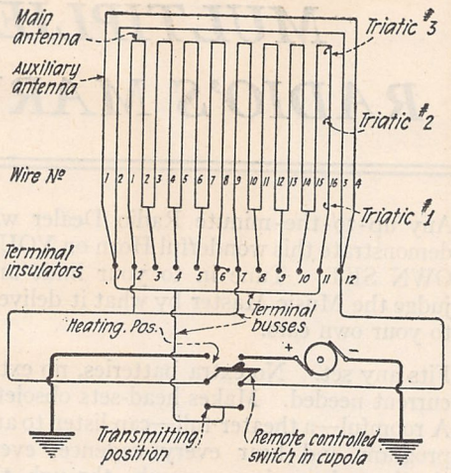
Satisfaction Guaranteed or Money Back.

We mail phones the day your order arrives Every pair tested, matched, and guaranteed as sensitive as $8 to $10 Sets. Circular Free.

Tower Mfg. Company

105 STATION STREET, BROOKLINE, MASS.

wires is linked together in grouping number three, according to the schematic diagram.



The Arrangement of the Antenna for a Power Station, Which Will "Shed" Ice Accumulation.

A system of so-called busses at the entering insulator terminals connect two sets of four loops each in parallel in the antenna proper and in series with the single loop formed by the supporting or auxiliary antenna. Thereby, a two-wire electric heating circuit is afforded, which envelops the complete system. The main portion of the antenna may be subjected to this passage of electric-heating current, independently, by placing a bar connector across the clips. The terminal clips are linked together by potential equalizing bars. The heating insulators, by the arrangement described, are relieved of all antenna potential.

Preliminary tests involving the use of the ice-melting circuit of the new antenna system afford the following results: Main and auxiliary antenna 162.5 amperes per wire, generator volts of direct current, 1,475; generator amperes of direct current, 3,251; kilowatts, 478; antenna resistance ohms, 4.54; temperature, 80 degrees Fahrenheit. When employing only the principal section of the antenna, the following ice-melting data were observed: 162 amperes per wire, 1,055 generator volts of direct current, 325 generator amperes of direct current, 343 kilowatts, 3.25 ohms resistance in the antenna, and the temperature was 84 degrees Fahrenheit. When the auxiliary antenna alone was subjected to the ice-melting process the following results were obtained: 162½ amperes to each wire, 420 generator volts of direct current, 325 generator amperes of direct current, 135 kilowatts, 1.29 ohms antenna resistance, with the temperature registering 84 degrees Fahrenheit.

The antenna in its completed form takes the shape of the letter L. It weighs seven tons. Its length from the anchor block to the far end is 3,100 feet and the mean height is 300 feet. The precise lengths of the triatics or stays to produce the requisite sags were obtained by the measurement of a uniformly loaded wire of weight, length, and sag having the ratio of one hundred to one. Such a procedure has been pronounced by the radio engineers of the Navy Department as a "practical, simple, and accurate method of solving this problem in the field." Forty thousand, two hundred and thirty-six feet of wire were used in constructing the antenna proper, while 12,591 feet were necessary in building the auxiliary antenna. Thirty-nine transmitting insulators were employed, 21 in the main section and 18 in the auxiliary portion of the antenna. This number, however, is only 61 per cent. of the number of insulators used in the old antenna system. The shunt capacity of the insulators to the ground in the new installation is, consequently only about one-half of that obtained by the discarded antenna.

The natural period of the new antenna was determined by connecting the arc directly

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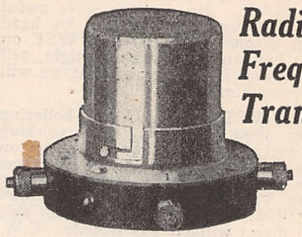

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in series in the antenna circuit without the loading inductance. This measurement indicated that the natural period of the complete system was 4,700 meters. The turns in the main helix or spiral-shaped electrical conducting coil of the discarded antenna system at 17,145 meters were 37.5. The capacity of the old antenna was .0153 microfarad. The turns in the main electrical conducting coil of the installation being described in this article at 17,145 meters, including both main and auxiliary sections, are 22. The capacity of the present radiating apparatus based on the capacity of the former system and the square of ratio of turns is .044 microfarad. The turns in the main helix or electrical conducting coil of the main section of the new antenna, at 17,145 meters, are 25. The capacity of the present antenna proper based on the capacity of the system displaced and the square of ratio of turns is .033 microfarad. By this token of reasoning or formula of calculations, the capacity of the new installation is 2.9 times that of the discarded antenna system.

The Annapolis radio-telegraph station, fringed in fresh garb, was subjected to a critical test on May 11, 1922, under high power conditions. The main and supporting parts of the antenna system were placed in parallel position, and 17,145 meters was the test unit applied. A new 750-kilowatt generator was pressed into service, supplying power to the arc with the following results:

Gen. Volts	Gen. Amps.	Radiation
500	300	220
510	400	250
825	500	330
1140	550	390

KW Input	25-Cycle Volts Line	25-Amp. Line
153	2250	40
220	2240	60
412	2220	130
628	1900	220

No corona or brushing.

The experimental installation of a low-pass filter circuit in conjunction with the Annapolis antenna "gave only indifferent results," to employ a conclusion of the investigators of the Bureau of Engineering, United States Navy Department. The trial demonstration was prompted by a theory advanced by the New York Navy Yard that such a filter eliminated the band of harmonics by providing shunt paths at low potential ends of load coil tuned to double the maximum wavelength of the band to be eliminated. The installation at the Annapolis radio-telegraph station involved the use of a two-stage filter consisting of .036 microfarad Telefunken oil condenser, in different combinations, shunted or side-tracked to the ground around one, two, and seven turns of the main helix. It was adjusted as closely as feasible to the wavelength bands of 500, 1,000, and 1,500. The device increased the main wave, and shifted the locations of the harmonics, but evidenced no tangible improvement in the elimination of interference. The radio engineer negotiating this experiment for the Navy Department, in the light of the facts just presented, concluded that "the effectiveness of a filter of this type directly connected to a straight arc circuit of high power is considered questionable. The filter absorbed much of the antenna energy as indicated by blowing 120-ampere fuse wire links connecting the filter. It is considered that coupled arc offers greatest promise in eliminating harmonics from high-power arcs."

Should the electric-heating circuit for melting ice at the Annapolis station, as described in this article, be put out of commission, an emergency measure has been provided. The emergency unit consists of a wire auxiliary lighting steam plant comprised of 2-kilowatt, 125-volt direct-current generators on the same shaft. The power units of the high-power Annapolis radio-telegraph station consist of two 400-kilowatt and one 750-kilowatt electric-generating machines. The electrical disturbances set up by these generators have been of such

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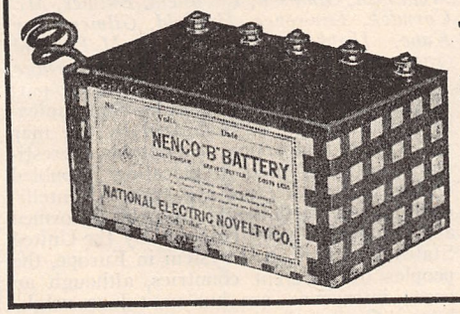

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force as to flash radio telegraph time signals from this point in Maryland to Australia, encircling nearly half the globe.

U. S. Radio Communication System Covers the World

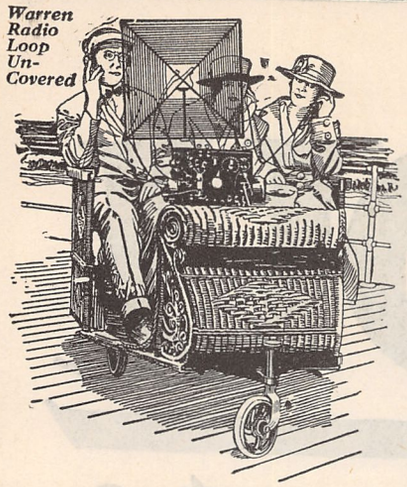
(*Continued from page* 1050)

leased telegraph line to Annapolis or Greenbury Point, Maryland, the most powerful station in the world. This station operating on 16,800 meters, transmits the communication to the United States Naval headquarters in Paris, France, from which point the communication is borne on electromagnetic waves to the chain of destroyers cruising in the waters near Constantinople. One-way communication, however, is only possible in this instance since there is no high-power wireless station at Constantinople.

The hitherto unpublished map accompanying this article shows the United States Navy communication system in Europe. The system, as indicated, is not entirely comprised of radio telegraph communication, but is spliced with land-line and cable. The United States Navy headquarters in Paris, France, for instance, in transmitting a message to the Navy Department in Washington, D. C., proceeds in this wise: Lyons, France, is the predominant radio-telegraph sending point of that country, the powerful Lafayette radio station at Bordeaux, France, now serving commercial interests. From Lyons the message directed to Washington, D. C., is routed by Bar Harbor, Maine, and thence to our National Capital by leased telegraph line. Naval authorities in Washington, however, communicate with Paris by means of the Annapolis wireless station.

Reverting to the major theme of this article, namely, the maintenance of wireless communication between the Navy Department in Washington, D. C., and destroyers cruising in the waters of the Near East, the message is sent to Paris by way of Annapolis, and the Naval authorities in Paris may communicate to Constantinople partly by a land-line telegraph system and in part by destroyers equipped with radio-receiving facilities. Or, if the flagship *Utah* is cruising in European waters, it is capable of intercepting wireless signals directly from the high-power station at Annapolis. This vessel acknowledges receipt of such communications by way of Bar Harbor, Maine, whence they are relayed by a leased telegraph system to Washington. However, the transmitting outfit on the battleship *Utah* is not powerful enough to communicate directly with the United States, but regardless of its location in European waters, it is capable of sending messages to Paris, from which point they are directly communicated to this country.

The 20 radio-equipped destroyers in and about Constantinople are: *Parrot, Edsall, MacLeish, Simpson, Litchfield, Bulmer, McCormick, Lawrence, Hatfield, Gilmer, Fox, Kane, Hopkins, Bainbridge, McFarland, Overton, Sturtevant, King, Goff,* and *Bridge.* The last is a supply ship. The part played by a worldwide radio-communication system, such as indicated by the map illustrating this article, cannot be overestimated, whether used in placating "troubled waters" or as a rapid-fire form of intelligence when battlefronts have been formed and carnage is being reaped. By the United States communication system in Europe, the peoples of different countries, although an ocean intervenes, are but next-door neighbors. Communications may be exchanged between America and Europe with quite the facility and dispatch that two neighbors in a city exchange gossip over a backyard fence. Pertinent to a discussion of this worldwide radio-communication system, is a prophetic remark recently made to this



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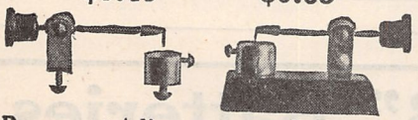

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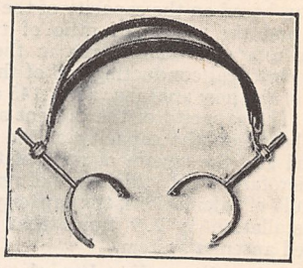

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writer by an eminent radio engineer of the United States Navy Department, to the effect: that if atmospheric disturbances or static electricity could be reduced to a negligible quantity, radio facilities would displace the cable as a means of Transatlantic communication.

The Housewife's Radio

(*Continued from page* 1052)

As readers of RADIO NEWS already know, the Department of Agriculture now maintains a nation-wide radio market news service. This is intended primarily to inform agricultural interests of the daily supplies and prices of farm products in the leading market centers of the country. But it has served another important purpose as well. Instead of "tuning out" the agricultural reports, housewives generally have been listening in on the messages with both ears. Information on prevailing supplies of fruits and vegetables enabled them to plan their preserving and canning operations, and a line on wholesale prices gave them a check against prices charged by retailers.

With increasing evidence of this use of the reports, the department planned to complete its service so that not only would the housewife know when to buy, but what to buy and how to cook it. It has a well-organized office devoted to studying the problems of household management, and to extend the benefits of the work to housewives by radio required simply furnishing the reports to broadcasting stations. This organization includes some of the nation's foremost dieticians and home management experts. The experimental kitchen maintained by the department is a revelation in culinary art. Here the nature and uses of agricultural products used in the home for food are studied, the making of jellies, economy in gas consumption, the economical use of different cooking fats, methods of utilizing meat in the home. Studies of the digestibility of foods such as animal and vegetable fats, cereal grains, flour, raw starch, meats and meat products are made. Menus intended to secure the greatest food values in mixed diets are prepared. Another important part of the work is the study of the uses of agricultural products for clothing, and the kinds of clothing most conducive to health and economy. Studies calculated to remove the drudgery from housework through the efficient planning of kitchens and the proper selection and care of household equipment are constantly under way.

The results secured by the investigators engaged in this work are published broadcast in special bulletins, the press and through extension workers connected with state colleges and other institutions. Specific assistance in home economics is given public institutions, teachers and individual housekeepers. Yet after all, only a comparatively small number of the 25,000,000 housewives in city and country are reached in this way. The department has found that recipes published in the newspapers are widely read and clipped by housewives. But interest in them is transitory. By using radio to broadcast the news, the department sees an opportunity not only to increase the number of housewives reached, particularly in cities, but to bring the message in a way to influence action. Broadcasting stations early learned that news brought by radio has a peculiar psychological effect. Itself the embodiment of speed and action radio stirs the listener to action.

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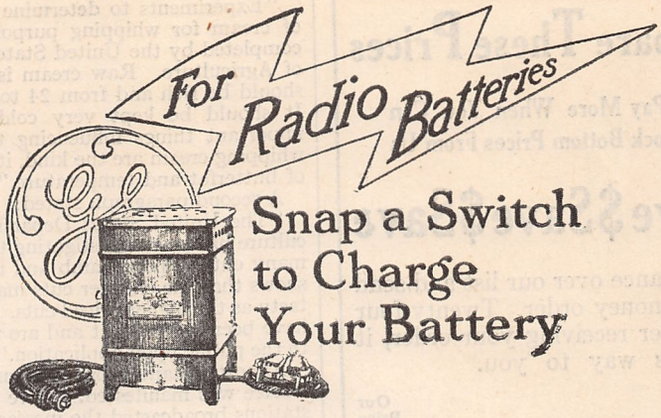

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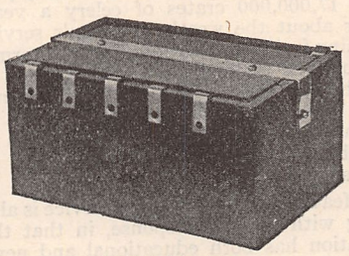

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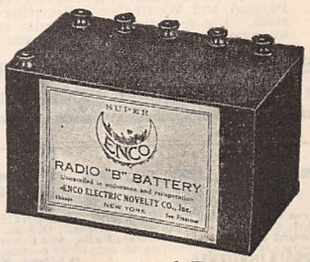

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A second paragraph stated:

"The United States Department of Agriculture has been investigating the uses of the many cuts of pork, lamb and mutton. This shows that the cheaper cuts may be made as tasty as the higher priced cuts. Many recipes have been worked out and are now available to the public upon application."

Almost instantaneous response to the new service was manifested. More than a dozen stations broadcasted the messages and many requests for recipes were received from both stations and novices. Within a week nearly 50 stations had incorporated the agriograms in their broadcasting programs, and the number of applications for the service is rapidly increasing. Largely as a result of this universal interest, the department has announced that its scientific work in home economics is to be greatly strengthened. The plan calls for the establishment of a Bureau of Home Economics that will rank with the other important bureaus in the department, and the bureau is to be headed by a woman trained in home economics work and who has a sympathetic understanding of the needs of both farm and city women.

The agriogram service also includes brief news items of the national agricultural situation. Urban dwellers are realizing as never before the part that agriculture plays in their daily lives, and there is a growing demand for agricultural information. City people want to know the condition of the nation's crops, whether there will be a large or small harvest and something about the farmer's financial condition. They are beginning to appreciate that when agriculture is prosperous all business is prosperous, and that the reverse is true when agriculture is in the doldrums.

The department's new service furnishes this information—the outstanding facts about agriculture. For example, one of the reports broadcasted by radio reads:

"Recent investigations by the United States Department of Agriculture show that the buying power of farm products, as expressed in terms of goods that farmers buy, decreased four per cent during the three months from March to June."

Another agriogram stated:

"Wages of the farmer, as represented by the prices received for his crops, are lower than before the war, measured in purchasing power, while the wages of the workmen are considerably higher for the same period."

Brief paragraphs of popular interest are also sent out. One of these is about the aeroplane campaign against the spread of wheat rust which destroys millions of bushels of grain each year; another about the protection of public forests; one about the development of celery production in the last few years from a novelty crop to an industry producing 17,000,000 crates of celery a year; another about the weather bureau's service in warning fruit growers of impending storms; one about the Federal inspection of foods so that labels on fruit and vegetable shipments contain no misstatements regarding quality or quantity; another about the protection of the public through Federal inspection of meats, and so on.

This feature of the agriogram service is also meeting with popular response, in that the information has both educational and news value. The department plans also to issue from time to time brief articles on what the department is and how it works for the advantage of not only the producer but of the consumer as well. In a word, some 50,000,000 people in cities are going to learn something

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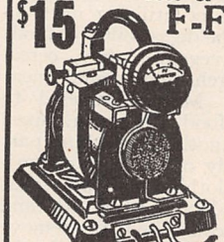

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about the great agricultural institution they help to support, what the annual appropriation for the department is spent for, and how it is spent. According to former Secretary of Agriculture E. T. Meredith, the department returns in value $1,000 for every dollar spent.

By radio, through the agriogram service, the department will tell how this result is secured.

Standardization Needed in Broadcasting Market News

(*Continued from page* 1052)

great movement conceived in the interest of agriculture.

Every receiving set in the agricultural sections of the Middle West may copy farm market news from its choice of from five to ten different broadcasting stations. The live stock, grain, dairy and poultry products, fruits and vegetables, and other market news, is broadcasted in different form from practically all of the stations. This condition creates a certain amount of confusion and dissatisfaction among receiving stations. Each one who "listens in" for the market news must contend with a different method of transmitting procedure from the various broadcasting stations within his range. Variation is not the spice of life in this sort of service. It is an abomination!

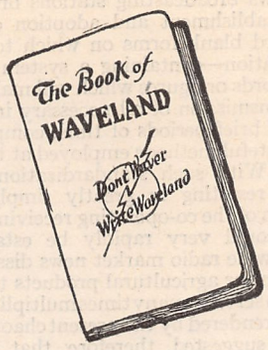
If the procedure in transmission of all kinds of market quotations by commercial telegraph companies was as chaotic as it is in the transmission of radio market news on agricultural products, the most efficient transmitting and receiving employees would be baffled, to say the least, if not suffer a very material reduction in their efficiency. The commercial organizations have long since well standardized their methods of procedure, as well as the blank forms used in connection with market quotations.

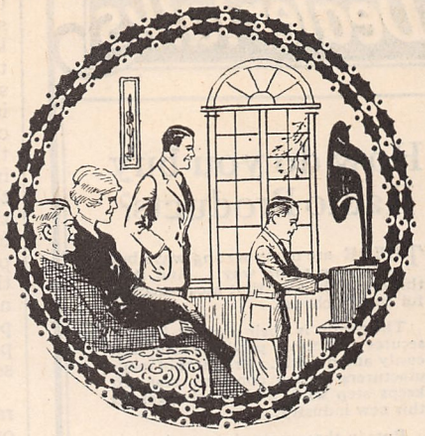
Transmission of farm market news by radio is not a fad. It is here to stay. It will take several years for the commercial merits of this new era of communication to fix itself firmly on agriculture and allied industries. The length of time necessary to bring this situation to a practical realization will depend somewhat on the efficiency of the broadcasting stations in dealing with the tens of thousands of receiving stations that are willing to cooperate to the best of their knowledge in disseminating the information broadcasted.

These tens of thousands receiving stations would, indeed, render an immeasurably great service if they would commence a persistent campaign demanding that stations broadcasting market news on agricultural products get together on a uniform basis of broadcasting the information and standardize the blank forms on which the information may be copied. A set of such blank forms could be worked out applicable to the majority of the products sold on our national markets. These blanks could and should be standardized for all states.

It would be little less than wonderful if the uncounted thousands of receiving stations located in rural territory, which are within easy range of Station WOS of the Missouri State Marketing Bureau, could be furnished with printed blank forms which are identical in size and subject matter and exactly fitted to the information broadcasted. Station WOS must necessarily limit its free distribution of blanks to receiving stations located within the state of Missouri, and these are becoming so great as to threaten the Missouri State Marketing Bureau with an unbearable burden of expense and labor.

At the present time the broadcasting stations handling market news on agricultural products either transmit frequently or use the





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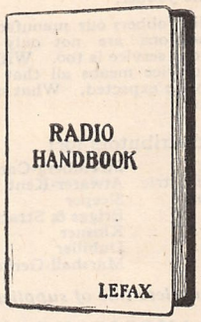

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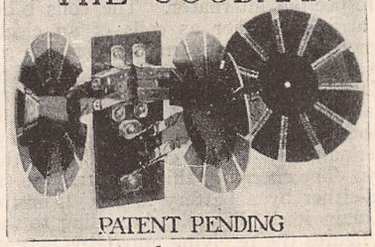

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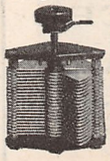

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ether for long periods at each transmission. Such overworking of the ether will continue until strict legal regulation stops it, or until successful co-operation on the part of the market news broadcasting stations brings about the establishment and adoption of suitable standard blank forms on which to copy the information—containing a system of key or code words or figures which will make possible the transmission of all necessary information in very brief periods of time, compared with the wasteful methods employed at the present time. With such standardization of blank forms, resulting in greatly simplifying the problem of the co-operating receiving stations, there could very rapidly be established a nation-wide radio market news disseminating program for agricultural products that would perform services many times multiplied over the service rendered by the present chaotic system.

It is suggested, therefore, that the entire radio fraternity use every available publicity organ for the purpose of at once starting a big drive in the direction of standardized blank forms for copying market news on agricultural products. Thousands of letters, and further magazine articles, should, during the next few months, be directed at every radio farm market news broadcasting station in the interest of this much-needed program of co-operation and standardization. The numerous well-trained government market news specialists now engaged in practical market reporting work in every large market of the United States are in a position to give valuable assistance in this matter through the offices of the United States Department of Agriculture at Washington. It must be done! Standardized blank forms mean conservation of ether, conservation of time and expense for both the receiving and transmitting stations, greater efficiency in making the information usable for all concerned, and quicker fixing and establishing this means of market news dissemination as one of the permanent essential factors of agriculture.

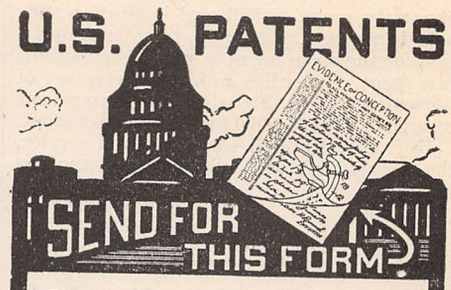
The Electric Light Line in a Dual Role

(*Continued from page* 1071)

coil b. If the other groups b^1 c^1 b^2 c^2 are not in resonance for this frequency N, the current of the generator will not pass through them. If N^1 represents the frequency for the currents produced by the second alternator d^1, it will be sufficient that the corresponding coil b^1 and condenser c^1 should be in resonance to enable the current to pass to the ground at t^1. In no case, however, will the current coming from the alternators d d^1 d^2 pass through the meter nor into the apparatus to be used.

It will be seen from the above that it is possible to simultaneously start the alternators d d^1 d^2 of the frequency N N^1 N^2 and to have at the customer's a series of groups of coils and condensers bcb^1 c^1 b^2 c^2, arranged in such a manner that each of them corresponds with one of the currents produced at the transmitting station, each group allowing only the currents to pass which comes from its respective alternator. The coils b b^1 b^2 are arranged either as coils of an electromagnet attracting an armature or as a solenoid actuating a core, as represented in Fig. 2. Under the action of the current coming from the alternators d d^1 d^2 these coils will produce a mechanical effect which may be employed either directly or in combination with a relay. The energy of this relay may be supplied either by a battery x, Fig. 2, or from the main itself, Fig. 3. According to these two figures the receiving apparatus actuated by the relay is placed at y. According to the power of the mechanical effect to be obtained, one or the other of these devices will be employed. It is thus possible to produce at the house of the customer various mechanical actions by starting the alternating currents d d^1 d^2 and by closing at certain moments the interrupters i i^1 i^2.

U.S. PATENTS



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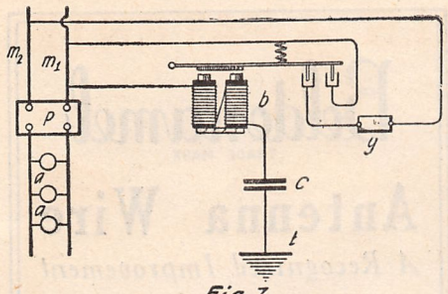

Fig. 3

This System of Relay for Remote Control Responds Only to One Frequency.

The system d b c may, for instance, actuate a time-indicating apparatus. According to this the interrupter i will be automatically closed every minute for one or two seconds, and the coil b, preferably arranged as an electromagnet, so arranged as to turn the minute-wheel to the extent of one tooth each time, the minute-wheel being combined with a dial system of any kind.

For communicating the time to a customer, it will suffice to provide him with a group coil b and condenser c in resonance for the frequency N and a receiving dial. The second system d^1 b^1 c^1 may, for example, actuate the general interrupter of the circuit at the customer's house, so as to close and open the circuit for working the corresponding interrupter i^1. Such an arrangement may be carried out by contract with the customers, who, according to their contracts, have no right to current until a certain hour. By thus employing different frequencies, certain effects may be produced at the customer's house at, say, 8 o'clock, others at 9, 10, and so on. It would also be possible

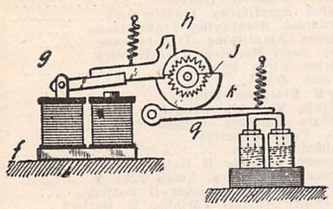

Fig. 4

A Type of Relay for Remote Control, as Described in this Article.

to employ only one alternator d^1 for cutting the current at the customer's house at different hours, if the following arrangement is adopted. This arrangement (represented by Fig. 4) consists, essentially, of an electromagnet f, so arranged as to attract a pivoted lever g, of soft iron. In the prolongation of this lever and forming one body with it is provided an extension h, of non-magnetic metal, in the shape of a watch-escapement pawl, gearing with a toothed wheel j, on the shaft of which is mounted a cam k, which cam can be easily removed and replaced by one of different form. The cam actuates an interrupter q of any kind, and it will be easily understood that by varying the shape of the cam it is possible to couple or uncouple the interrupter at different hours, according to the different customers on the network. The cams should be easily interchangeable, so as to render it possible to change, according to the desire of the customer, the hours of lighting up and extinguishing the lights. The same system may be applied not only to the whole set of the apparatus of a customer, but also separately to some of them —arc-lamps, motors, and the like. It may also be used for lighting and extinguishing the lamps used for public-lighting purposes. A third way of making use of these arrangements will be for the purposes of telegraphing to points on the system. If, say, i^2 is a Morse key, the corresponding groups b^2 c^2 may be made to act as a Morse receiver. The alternators d d^1 d^2 may be of any kind. It is, however, preferable to employ high frequencies, so as to reduce as much as possi-

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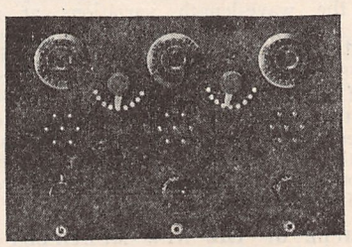

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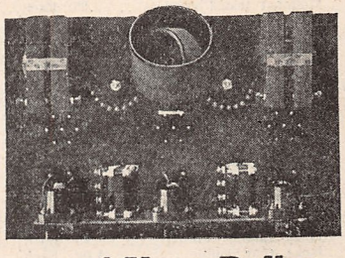

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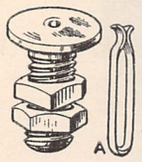

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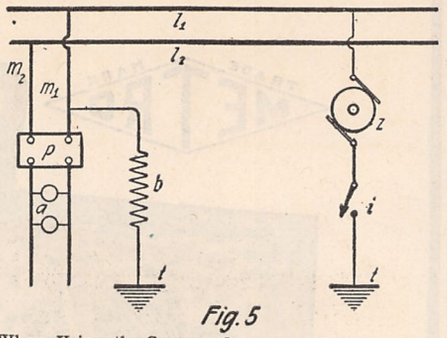

Fig. 5

When Using the System Over an A.C. Line, D.C. May be Used to Operate the Remote Control Relay.

ble the dimensions and the price of the condensers c c^1 c^2.

Any form of generator of alternating currents may be employed, such as Ruhmkorff coils, magnetos, and the like.

In cases where distribution is obtained by alternate currents, one of the alternators d may be replaced by a continuous current dynamo z. In such a case the condenser c will be dispensed with. The coil b, Fig. 5, will itself select the continuous current.

In a general case when condensers are employed the loss of energy of the alternator d, resulting from losses through the ground of the system, may be reduced to a minimum by interposing between the interrupter i and the ground t a special condenser c^3. (Shown in dotted lines, Fig. 1.)

In the case in which the additional current is continuous the condenser will be replaced for the same purpose by self-induction.

A New Method of Doubling the Efficiency of High Power Stations

(*Continued from page* 1071)

increase the power to send a second telegram, since the first absorbs all the available power. Even if it were possible to furnish more energy to the antenna, this could not be done, as the tension produced by a single series of oscillations reaches the breakdown limit of the insulators. If, under such conditions, one would use the Diplex system, it would be necessary to send in the antenna for each telegram, but half the intensity of current that would be utilized for a single transmission. The power radiated in this case would be, therefore, only one-quarter of the total power of the station and the range would be reduced in a great proportion; it is for these reasons that the Diplex system is not used in high power stations.

Another method of Diplex telegraphy was recently proposed based upon the use of a commutator turning at high speed and producing the wave-length variations at a musical frequency. We shall not describe in detail this clever system because it is not practical for high power stations on account of the difficulties encountered in the construction of the commutator which should carry very high intensities. It is also important to know that this method wastes half of the power in auxiliary waves which are useless for the receiving station.

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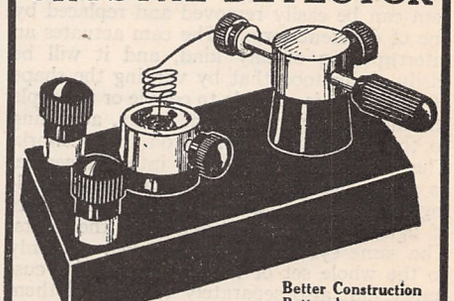

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transmitted on a certain wave-length, A, and the second on another wave-length, B. The transmitting set is arranged so that the change in wave-length is made instantly.

When the two keys are down at the same time, the arrangement is such that instead of sending on one or the other of the wave-lengths, A and B, a third wave-length, C, is radiated. In some cases it is possible that a fourth compensating wave-length, D, be sent when the two keys are up. Thanks to the system of the third wave-length, C, the first telegram is sent on the wave-length, A or C, depending upon the position of the key which is used to send the second telegram. These waves, A and C, consequently carry the first message. To receive this transmission, the receiving set is arranged so that it can receive either the wave-length A or C, but only these. The second message is received in the same way on the wave-lengths, B and C. By referring to the diagram, Fig. 1, which shows the letter M for the first message and N for the second being sent at the same time, it is easy to follow the changes from the first or second wave-length to the third.

The new method may be utilized in any system of transmission. In the case of arc transmission, the Diplex installation is very simple. It may be accomplished according to the diagram shown in Fig. 2. The arc transmitter, the antenna of which is connected to an inductance, acts by induction upon the two coils, 1 and 2. The working position is obtained when the keys are up. Under these conditions, the aerial radiates three wave-lengths, A, B and C, while one the other or both keys are up at the same time. The compensating wave, D is radiated when both keys are down simultaneously.

The reception of the signals is just as easy to install; the sketch Fig. 3 shows how the aerial is connected to a selective receiver 1 and 2 being tuned on the frequencies which are utilized in the sending station. These resonance tuners, thanks to a series of parallel connections, operate the receiving set itself which may be a recording device or any other apparatus used between the reception of messages. When the transmission is made a certain wave-length which is the resonator, 1, which operates the receiver, 3, and when the wave-length passes to the second value, it is the second resonator, 2, which operates the receiver, 3, so that the receiving set responds to only two wave-lengths which may be A.C. or D.C.

The actual tests were made from the stations of the French Navy. The transmission was sent from the 100 K.W. Arc station, UA which worked at full power sending simultaneously two telegrams. The receiver was installed in Paris where it was possible to receive either with telephone receivers or by means of a Morse Inker. The experiments were quite successful and gave full satisfaction; it was possible to receive one or the other telegram by simply varying the capacity of a condenser and it would have been possible to record both telegrams at the same time.

These experiments prove that this Diplex system for the high power stations can be used commercially. It becomes possible to double the output of a station without increasing the cost of the upkeep and consumption of current. This will permit the sending of the traffic during the best hours of the day to the countries where reception is greatly hampered by static and other causes. Another point which is to be taken into consideration is that the constant changes in wave-lengths make the transmission unreadable on an ordinary receiver which is not equipped for the reception of at least two of the wave-lengths as shown in the diagram, Fig. 3.

This new method, consequently, helps to a great extent to insure the secrecy of radio communications.

—*Abstracted from l'Onde Electrique.*

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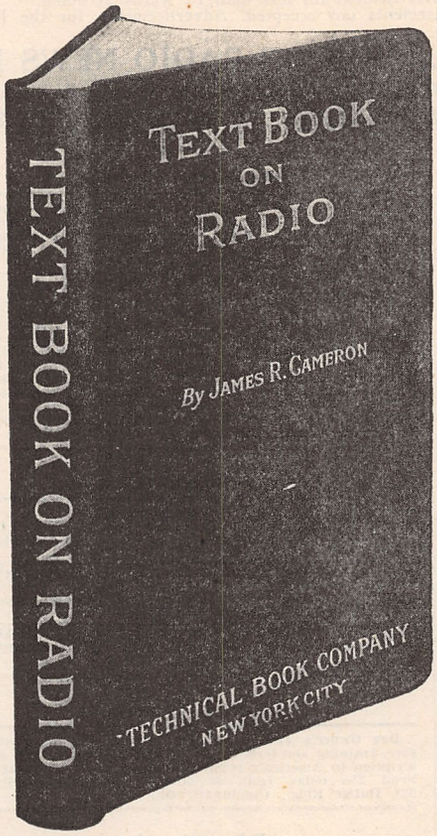

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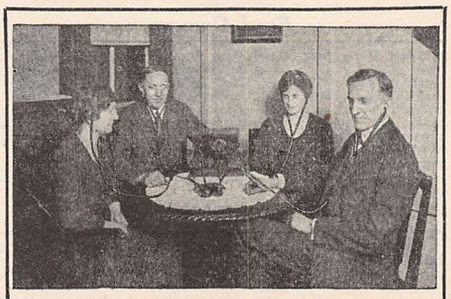

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Wanted—Young men and women to learn Morse and Wireless Telegraphy. Railroads and Wireless Companies in great need of operators. We teach you quickly, and procure positions at big salaries. Great opportunities for advancement. All expenses low; can earn part. Write today for free catalog. School established 1874. Dodge's Telegraph Institute, M Street, Valparaiso, Indiana.

Ventriloquism

Ventriloquism taught almost anyone at home. Small cost. Send 2c stamp today for particulars and proof. Geo. W. Smith, Room 542, 125 N. Jefferson, Peoria, Ill.

Wanted to Buy

Full value paid for old gold jewelry, watches, diamonds, crowns, bridges, dental gold, silver, platinum, gold or silver ore, magneto points, war savings stamps, old false teeth. Packages held 4 to 12 days and returned if our offer is not satisfactory. United States Smelting Works (The Old Reliable), 120 So. State St., Dept. 16, Chicago, Ill.

Cash for Old Gold, Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magneto Points, Jobs, any valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. Ohio Smelting Co., 304 Hippodrome Bldg., Cleveland, Ohio.

Wireless

Edison B. Battery Units—One positive and one negative plate for 10c. 18 sets will make a 24-volt battery. Wilkinsburg Wireless Shop, 711 Penn Ave., Wilkinsburg, Pa.

Unique Radio Cabinets, with loud speaker enclosed. Excellent tone qualities. Mahogany finish. Eight by Twenty-four, Twelve by Twenty-four, ten and twelve dollars respectively. Panel front Cabinets, without speaker, Eight by Twelve, Eight by Twenty, three fifty and four fifty respectively. Postpaid. Guaranteed. Dealers' and Agents' proposition. Address Dept. T, Wood Specialty Co., Camden, N. J.

Free—With every UV 200 Tube $5, UV201 Tube $6.50, Murdock 2,000 ohm Phones $5, or Brandes Superior Phones $8, you will receive an Amateur Radio Call Book Free. Immediate Delivery postpaid. Wright Electric Co., Scottdale, Pa.

Increase detection by using a telephone magnet as described in "Radio News" for June, 35c each to any address in United States, post paid. Walter Varrell, Laconia, N. H.

Paragon RA Special, $50. Wavelength 170-500 meters—otherwise exactly like RA10. Baldwin type E phones, $12.50. Bradleystats, $1.80. French Ray-O-Vac "B" batteries, 22½-volt variable, $3; 45-volt tapped, $4.50; Jefferson Amplifying transformers, $4.25. Remler Giblin mounted coils for Super Regenerative, 1,500 M, $4.25; 1250 M, $3.80; 300 M, $2. King Amplitone Loud speakers, $11.50. Arkay loud speakers, $5. Remler apparatus, 3-amp. rheostats, $1.70. Junior rheostat, $1; V. T. sockets, $1; Knob dial, 75c. "Homechargers," $17. 7-strand No. 22 tinned antenna wire, 85c per 100. Dubilier Ducons, $1.40. Musio crystal Radiophone receiver, with antenna equipment, $12.50. Guaranteed range 35 miles. 24-hour service. C. R. Smith, Radio Company, Port Arthur, Texas.

Fellows! Have complete command of the ether, correct hookup (the secret). Blueprint, 50c. Radio Hookup Co., Box 289, Superior, Wis.

Attention!—50 Vacuum tube hook-ups. The greatest collection of vacuum tube circuits ever brought under two covers at such insignificant cost. These diagrams will be found in the great "Rasco" catalog, which contains raw materials and parts in a greater profusion than any other catalog. 15c in stamps, or coin, will bring the catalog to you. Radio Specialty Co., 96-98 Park Place, N. Y.

Boys! Don't Overlook This. The "Rasco" Baby Detector. Greatest detector ever brought out with molded base. Fully adjustable. See former advertisements in this publication, or our catalog. Detector with Galena Crystal, complete 50c, the same detector with Radiocite Crystal, 75c prepaid. Send for yours today. Radio Specialty Company, 96-98 Park Place, New York City.

For Immediate Delivery—Tubes, Magnavox, Westinghouse Receiving Sets, Phones, Condensers, Rheostats, Variometers, Couplers, Panels, Transformers, V. T. Sockets, Dials, Switch Points, and full line of parts. R. B. Electric Co., Galva, Ill.

This Is Real Service—Panels cut to order, smooth sawed edges. We cut them exactly to size and ship the same day your order is received. ¼-inch thick, 1½c per square inch; 5/16-inch thick, 2c; ⅜-inch thick, 3c; 7/16-inch thick, 3½c; ½-inch thick, 4c; why pay more? These radio panels are made of the highest grade black fiber. This material possesses high dielectric strength, is inexpensive, unbreakable and easy to work. Our special offer, radio panels 6x6x¼ inches, 50c; 6x12x¼ inches, $1. We also carry a complete stock of fiber rod and tubes, the real thing for electrical insulation, special prices quoted upon application. We pay postage. Radio Instrument & Panel Co., Box 75, Cicero, Ill.

Stromberg-Carlson Phones, $6.45; Thordarson amplifying transformers, $3.90; metal socket, 69c; CRL rheostat, 68c; 43-plate condensers, $3.50. Complete reduced price list for stamp. Radio, 6239 Dix Avenue, Detroit, Mich.

Wireless Course in 20 Lessons. By S. Gernsback, A. Lescarboura and H. W. Secor, E. E. Tells you everything you want to know about "Wireless"—theory, practice and history. A clear, concise course on every phase of this subject. 160 pages—350 illustrations, 30 tables. Stiff cloth cover, $1.75, postpaid. Experimenter Publishing Co., Book Dept., 53 Park Place, New York.

Wireless (Continued)

Build your own electrolytic storage battery charger. Plates and complete instructions, $1.00. Descriptive Circular Free. Peerless Electrical Parts Co., 105 Harris Street, Rochester, N. Y.

Resistance Wire. Make your own rheostats. 22 Thermax wire, capacity 2 amps. Without heating, 2c per foot. Resistance approximately 1 ohm per foot. Menhinick, P. O. Box 1542, New Orleans.

Black Fiber Panels, nicely finished, 7x18x3/16 inches, $1.25, cut to order any size. .01 square inch. Immediate Delivery. Geo. H. Mollahan, Lowell, Mass.

The Lowest price Radio store in the world offers: UV 200 Tubes, $3.95; UV201 Tubes, $5.25; VT1 Tubes, $5.95; VT2 Tubes, $6.95; Acme Transformers, $3.75; Sockets, 25c to 60c; Switch Arms, 15c to 40c. Variable Condensers, 3 plate, $1; 11 plate, $1.25; 23 plate, $1.75; 43 plate, $2.25; Phone Condensers, 10c to 25c; and 1,000 other items at the lowest prices. New and Standard goods. Postage free on $1 purchases and over. Send money order. No checks. Liberty Radio Company, 106 Liberty Street, New York City.

Radiotron, Westinghouse, Myers & W. E. V. T.'s. We specialize in the distribution of vacuum tubes which are opened and tested before shipping, thus assuring you of satisfactory operation. Radiotron U. V. 200 detector, $5. Radiotron U. V. 201 amplifier, $6.50. Radiotron U. V. 202 power tube transmitter and amplifier, $8. All Radiotron tubes supplied with Radeco safety fuse as premium. Westinghouse WD11 Aeriotron detector tube for Aeriola Sr. Sets, whose filament operates on 1.5 volt dry cell, $8. Western Electric 216A amplifiers for W. E. Loud Speaker, $12. Myers HI-Mu Audion amplifiers and detectors, $5. We insure all tubes and prepay postage. A complete stock of well-known vacuum tube accessories and radio supplies awaits your order. Try us! Immediate Delivery or remittance returned. The Kehler Radio Laboratories, Dept. R, Abilene, Kans.

Save 10 per cent. to 50 per cent. on all Radio Supplies. Send stamp for complete price list. Kuhn, 1806 Lafayette, St. Louis, Mo.

$10.00 Variometers—$3.00 while they last, manufacturers' samples. Horton, Christie Street, Ridgefield Park, N. J.

Variable Condensers Unassembled, 23 plate, $1.60; 43 plate, $2.60. Aluminum plates, Machined Spacers, Condensite Ends. Gravenstede, 84 Hancock Avenue, Jersey City, N. J.

C. W. Transmitter, motor generator, filter, chopper, microphone, key, thermo ammeter, voltmeter, plate ammeter, transformer, 7½ V.-1,000 V., hard rubber panel, quick change over C. W., buzzer, chopper, self-rectified C. W., voice, excellent order. Bargain. J. E. Egleson, 12 Felton Avenue, Ridley Park, Pa.

Rechargeable B Battery pasted plates, Positive, 12c; Negative, 12c; Jars, separators, 6c; complete cell, 30c. Send for latest radio catalog. Electric Service Shop, Bradford, Ill.

Amateurs: Send for our special amateur price list for some real bargains. D & R Radio Supply Co., Fort Dodge, Iowa.

Radio Bugs, get our new catalog and late prices of vacuum tubes, magnavoxs, phones, everything ready for shipment. Electric Service Shop, Bradford, Ill.

Buy a radio set on easy payments. D & R Radio Supply Co., Fort Dodge, Iowa.

Wesco Radio Receiver—All wave range tuner, three step amplifier—operates R3 Magnavox to maximum, heard for half mile, complete, $100. Send for literature. Electric Service Shop, Bradford, Ill.

Transmitter — DeForest, 1KW Transmitter complete. Latest model, perfect condition. Price, $2,500. This outfit has perfect modulation and great range. Immediate delivery. Daniels Radio Supply Company, Independence, Kans.

Stromberg-Carlson Phones. The professional headset at the amateur's price. Super-sensitive, comfortable, durable. Impedance correct for phone work with modern vacuum tubes. Equipped with five-foot polarity indicating, moisture-proof silk cords. A real radio headset for $7.50. Carrollton Radio Shop, Carrollton, Missouri.

Radio Cabinets. In stock sizes or to order. All wood tone chamber, with or without phonograph combination. Columbia Mantel Company, 175-177 Powers Street, Brooklyn, N. Y. Telephone, Stagg 2726.

Battery Plates, Separators, Connectors, Straps, Jars, Box and Handles to make 6-80 Battery, complete, $10. Ajax Battery Co., Inc., Rochester, N. Y.

$1 Radio Frequency Transformers—Hear distant stations. Designed to fit any standard socket. Three sizes—160-500M, 500-1000M; 1000-2000M. Complete set of parts and full directions for assembling, postpaid, $1; 3 for $2.75; 6 for $5. Arkenberg Agency, 702P, World Bldg., New York.

Aerial Wire. Strong, efficient, tinned bronze stranded wire, 500 pounds strength, 2½ times the surface of No. 14 solid wire, ideal for high frequency reception. 100 feet, $2 postpaid; 7x22 copper 100 feet, $1. No. 20 cotton and wax insulated copper wire for indoor antenna, 235 foot coil, 75c. Anthracite Electrical Company, P. O. Box 82, Wilkes-Barre, Penna.

The market is flooded with radio frequency transformers and amplifiers, but regardless of unsatisfactory experiences with radio frequency, do not be discouraged. The Miller Super Amplifier is a true radio frequency amplifier covering all ranges from 150 to 24,000 meters at equal efficiency. No critical adjustments, no grief, but real results. Your name on a postal brings full data. Coast Radio Company, El Monte, Los Angeles, Calif.

Climax Radio Frequency Transformers, 200 to 300 meters, with blue print and instructions $2. Variometers, with 3-inch dial $2.85, Variocouplers, 14 taps, 3-inch dial, $2.50, 23 plate variable condensers $2.35, 43 plate $2.85. Triple coil mountings $2.75. Inductance coils (honeycomb) D. L. 25 to D. L. 200, with plugs 95 cents each. Send for bulletin. H. Butterworth, 331 Quincy St., Brooklyn, N. Y.

How to Make Wireless Receiving Apparatus. 100 pages—90 illustrations. Only strictly modern radio apparatus are described in this book and the illustrations and descriptions are so clear and simple that no trouble will be experienced in making the instruments. Paper covered, 35c. postpaid. Experimenter Publishing Co., Book Dept., 53 Park Place, New York City.

How to Make Wireless Sending Apparatus. 100 pages—88 illustrations. Written and published entirely for the wireless enthusiast who wants to make his own radio apparatus. Contains more information on "how to make it" than any other book we know of. **Paper bound** 35c. postpaid. Experimenter Publishing Co., **Book Dept.,** 53 Park Place, New York City.

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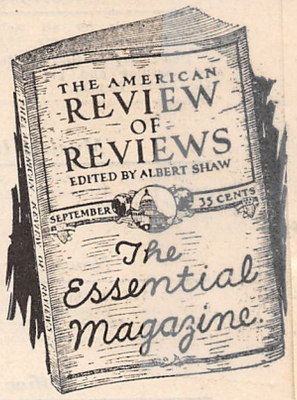
Class No. 45

For Special Clubs
Class No. 50

For Special Clubs
Class No. 30



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With Hearst's International
Both to One Address
Class No. 105

For Special Clubs
Class No. 37

For Special Clubs
Class No. 50

Christmas Gifts for All

Give a subscription to your favorite magazines for Christmas. They make a most welcome, pleasing and appropriate gift and remain a gracious and constant reminder of the giver throughout the whole year. No other gift at such small expense can compare favorably with a yearly subscription to a few of your favorite magazines.

You can make your selection from the Radio specials or the attractive combinations listed on these two pages—or you can make up your own clubs from the magazines named and by adding the class numbers shown and multiplying the total by five, you will have the correct cost of your special club (see following example).

Example.—Suppose that you wish to subscribe to Radio News, Science & Invention and Boys' Life. Radio News is Class 45, Science & Invention is Class 45, and Boys' Life is Class 35, total 125. Multiplying by 5 equals 625. You remit $6.25, a saving of $0.75 over the regular subscription prices.

Should you wish to renew your own subscriptions, no matter when they expire, we will see that they are extended for the proper time.

Please do not wait for the last minute rush—send us your list now to insure arrival of the magazines by Christmas. We will enclose Christmas cards in your name if desired.

RADIO SPECIALS

Can be clubbed with any publication by using their class numbers as explained above.

Class Nos.	Magazine	Regular Price	Extra for Canada	Class Nos.	Magazine	Regular Price	Extra for Canada
45	RADIO NEWS	$2.50	$0.50	40	Q. S. T.	$2.00	$0.00
45	SCIENCE & INVENTION	2.50	.50	75	Scientific American	4.00	.50
45	Wireless Age	2.50	.50	50	Popular Science Monthly	2.50	.00

A FEW SPECIAL CLUBS

RADIO NEWS $2.50
SCIENCE & INVENTION 2.50
Both **$4.50**
You Save $0.50
(Canada $1.00 extra)

RADIO NEWS $2.50
PRACTICAL ELECTRICS 2.00
Both **$4.00**
You Save $0.50
(Canada $1.00 extra)

SCIENCE & INVENTION $2.50
PRACTICAL ELECTRICS 2.00
Both **$4.00**
You Save $0.50
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SCIENCE & INVENTION $2.50
American Magazine 2.50
Both **$4.75**
You Save $0.25
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Both **$2.75**
You Save $0.50
(Canada $0.50 extra)

RADIO NEWS $2.50
Collier's Weekly 2.50
Both **$4.25**
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RADIO NEWS $2.50
Boys' Life 2.00
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SCIENCE & INVENTION $2.50
Review of Reviews 4.00
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(Continued next page)

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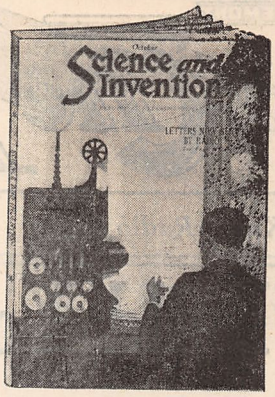

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American Magazine	2.50		
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SCIENCE & INVENTION	$2.50	Both	$4.25
Collier's Weekly	2.50		
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RADIO NEWS	$2.50	Both	$5.25
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RADIO NEWS	$2.50	Both	$3.25
McCall's	1.00		
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RADIO NEWS	$2.50	All for	$6.25
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SCIENCE & INVENTION	2.50		
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SCIENCE & INVENTION	$2.50	All for	$7.50
*Hearst's International	3.00		
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You Save $1.00			
(Canada $1.50 extra)			
RADIO NEWS	$2.50	All for	$5.75
American Magazine	2.50		
People's Home Journal	1.25		
You Save $0.50			
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SCIENCE & INVENTION	$2.50	All for	$5.00
Boys' Life	2.00		
McCall's	1.00		
You Save $0.50			
(Canada $0.75 extra)			
RADIO NEWS	$2.50	All for	$7.00
Review of Reviews	4.00		
PRACTICAL ELECTRICS	2.00		
You Save $1.50			
(Canada $1.00 extra)			

SCIENCE & INVENTION	$2.50	Both	$4.00
Boys' Life	2.00		
You Save $0.50			
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RADIO NEWS	$2.50	Both	$3.75
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RADIO NEWS	$2.50	Both	$4.10
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You Save $0.40			
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RADIO NEWS	$2.50	Both	$3.75
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PRACTICAL ELECTRICS	$2.00	All for	$6.75
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Collier's Weekly	2.50		
You Save $1.75			
(Canada $3.00 extra)			
RADIO NEWS	$2.50	All for	$7.50
*Hearst's International	3.00		
*Cosmopolitan	3.00		
You Save $1.00			
(Canada $1.50 extra)			
PRACTICAL ELECTRICS	$2.00	All for	$4.25
McCall's	1.00		
Pictorial Review	1.50		
You Save $0.25			
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SCIENCE & INVENTION	$2.50	All for	$6.75
Review of Reviews	4.00		
Pictorial Review	1.50		
You Save $1.25			
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RADIO NEWS	$2.50	All for	$7.00
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You Save $1.00			
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SCIENCE & INVENTION	$2.50	All for	$5.50
Youth's Companion	2.50		
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You Save $0.50			
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RADIO NEWS	$2.50	Both	$4.50
Youth's Companion	2.50		
You Save $0.50			
(Canada $1.00 extra)			
SCIENCE & INVENTION	$2.50	Both	$4.10
Modern Priscilla	2.00		
You Save $0.40			
(Canada $0.75 extra)			
RADIO NEWS	$2.50	Both	$3.25
People's Home Journal	1.25		
You Save $0.50			
(Canada $0.50 extra)			
SCIENCE & INVENTION	$2.50	Both	$3.25
People's Home Journal	1.25		
You Save $0.50			
(Canada $0.50 extra)			
RADIO NEWS	$2.50	All for	$7.00
*Hearst's International	3.00		
*Good Housekeeping	2.50		
You Save $1.00			
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SCIENCE & INVENTION	$2.50	All for	$7.00
*Cosmopolitan	3.00		
*Good Housekeeping	2.50		
You Save $1.00			
(Canada $2.00 extra)			
SCIENCE & INVENTION	$2.50	All for	$6.25
McCall's	1.00		
Review of Reviews	4.00		
You Save $1.25			
(Canada $0.50 extra)			
PRACTICAL ELECTRICS	$2.00	All for	$7.25
Youth's Companion	2.50		
Review of Reviews	4.00		
You Save $1.25			
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SCIENCE & INVENTION	$2.50	All for	$7.00
*Hearst's International	3.00		
*Good Housekeeping	2.50		
You Save $1.00			
(Canada $2.00 extra)			
RADIO NEWS	$2.50	All for	$5.60
Woman's Home Companion	1.50		
Modern Priscilla	2.00		
You Save $0.40			
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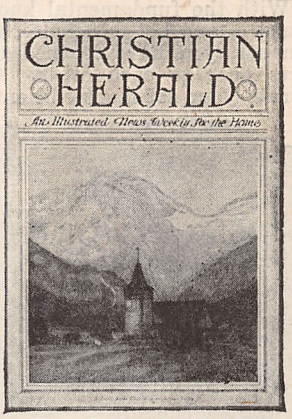

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With Good Housekeeping
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FREMONT

The Radio Advisor

FREMONT

Know Radio — DECEMBER 1922 — Know Radio

"Build Your Own Set," Says Radio Expert

KNOWLEDGE OF RADIO GIVES GREATER ENJOYMENT TO FANS

"You can't know Radio unless you wire your own set," says Mr. Singer; Cites cases where buyers of complete sets unwired outfits to learn functioning of parts

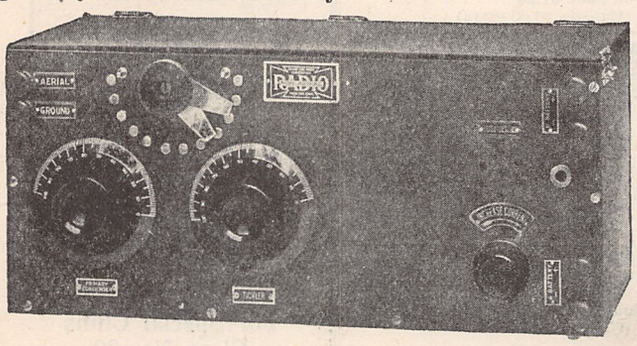
"Every Radio Enthusiast must build his own receiving set before he will really understand the operation and enjoy the best results from his receiving set." So says Mr. E. Singer, associate member of the I. R. E. and A. I. E. E.

Mr. Singer is considered by the Radio Fraternity as one of its foremost technical and practical members. He has been of great assistance to the Radio fan through his many articles on Radio which have appeared in leading Radio magazines throughout the country. Consequently his words aroused more than passing interest and it was only natural that he should be asked for further reasons why he holds his belief.

"Ask any one who has played with Radio for any length of time," he says, "and I'll wager each and everyone will tell you, he learned the fundamentals of radio from wiring up his own set.

Pleasure Comes with Knowledge

"With the fundamental knowledge of radio comes greater pleasure, and better results, for through the wiring of your own set, you have learned the relation which the various parts bear to each other. Consequently, you are able to operate your set more efficiently.



Outside View of the Fremont A. W. No. 1—$35.00 Set

"Personally, I know of several cases where radio enthusiasts, a few months ago, invested in radio sets only to discover, much to their sorrow, that on account of being unfamiliar with the fundamentals of radio they were unable to operate the sets properly. These same enthusiasts today, less than a month after they made their first investment, are getting double the pleasure from their sets.

They Get Experience

"Why? Because shortly after installing these sets they learned that radio to them was more of a mystery than ever, due mainly to the fact that they did not know the right functioning powers of the various parts. They read many books on radio only to find the numerous technical terms deepened the mystery.

"Then, to some, it occurred that the greatest knowledge could be gained by taking apart their sets and rewiring them, making note of the relation which each part bore to the other. Others purchased complete sets unassembled which they put together themselves. Their pleasure today is twice as great and, needless to say, their sets are now operated more efficiently.

Buy an Unwired Set

"Quite frequently I am asked by some one who has just become interested in radio as to what set to buy. Doubtless there are many sets on the market today, made by reliable manufacturers, that give satisfactory results. Yet I never advise the purchase of a completely wired set.

"A few years ago I was an amateur in radio work. I learned the fundamental principles from wiring my own set. My experience and the experiences of those radio enthusiasts I mentioned before surely should emphasize the fact—you can't know radio unless you build your own receiving set."

Essential Parts Needed for Building Tube Set

Here's a list of some essential parts necessary for building your own receiving set. Long Wave Variometer, Variable Condenser, Socket, Rheostat, Panel, Cabinet, Binding Posts, Jack, Dials, Grid Leak, Fixed Condenser.

A Radio catalog containing a complete list of Radio parts can be obtained, free of charge, from The Fremont Radio Sales Co., 50 Church Street, New York City.

He's Happy Now— He Read Our Ad

Now the Proud Owner of a Tube Set Which He Understands

By ALBERT E. DONNELLY

About July, 1921, I became interested in radio and, like numerous other people, purchased a crystal set. I thought that my set was great after talking to fellows who were having all sorts of trouble with their crystals and tuning.

After reading the newspapers and books on radio, naturally, I longed for a tube set. But the question came up, how will I get the money to buy this set ready made? Finally I decided to build my own. Then the fun began. First trying to get the right circuit, laying it out on paper, planning where the various parts were going. This kept up for a few weeks. Then the going around to the different stores to buy the apparatus, where I would be confronted with such advice as "Don't buy that socket it leaks," "that the transformer is poor," and many various other discouraging advice.

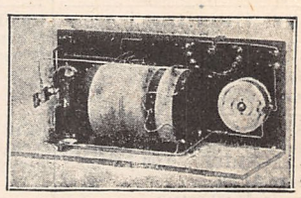
In the end I saw that unless I knew exactly what kind of a circuit I wanted and the name of the apparatus, my pocketbook was taking a chance.

This puzzle was solved when an ad in a magazine attracted my attention. It was a complete set unassembled. This ended everything. No worry about the circuit, design or apparatus. Holes drilled and everything. And results, they were great.

UNASSEMBLED SET NOW READY FOR MARKET

Fremont Radio Sales Co. Devises Plan to Aid Radio Enthusiasts

Complete Radio Receiving Set, unassembled, can now be obtained at big savings from a responsible Radio House. This concern is the Fremont Radio Sales Company, located at 50 Church Street, New York City. They manufacture a tube set which is shipped, unassembled, ready to be put together. This set is the Fremont A. W. No. 1 Set and can be bought direct for $35.00. Each part is wrapped separately. All parts are furnished except Detector tube and Phones. Panels are drilled and every necessary part, including diagrams for wiring are furnished with each set. Here is a tuner and detector combination which receives broadcasting news and concerts within a range from 150 to 3,000 meters.



Interior View

Guarantee Apparatus

Fremont apparatus carries a guarantee against all mechanical or electrical imperfections. Every instrument is thoroughly tested before shipment.

All remittances for direct orders on the Fremont A. W. No. 1 Receiving Set should be made by Postal Money Order or Express Money Order and should be addressed to Fremont Radio Sales Co., 50 Church Street, New York City.

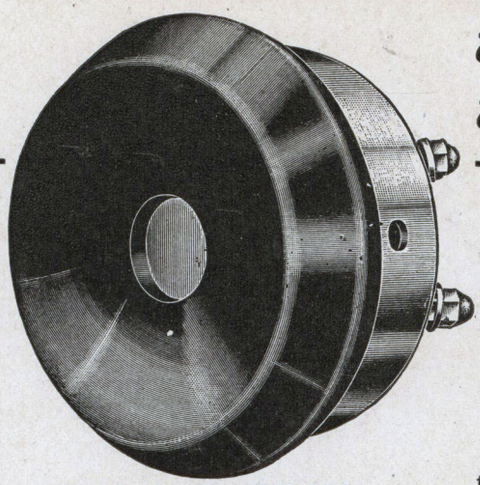
Order today and write name and address clearly to insure prompt shipment.

FREE RADIO CATALOGUE

Be sure to send for the fully illustrated Radio catalog containing various types of knock-down sets, issued free of charge, by the FREMONT RADIO SALES CO. at 50 Church Street, New York City.

THE "RICO" LOUD-SPEAKER PHONE

a remarkable phone



Loud-Speaker Phone With Cord

a remark-able price

$4.50

Here is the **loud-speaker phone** for which you have been waiting! For the first time you are now able to buy a single 2,000-ohm **loud-speaker phone** that has been planned by radio **and acoustic** engineers for one purpose, and one purpose only—namely, to reproduce sounds clear and loud through a horn.

Used in any standard horn, it will amplify the weakest of sounds so that the whole family can hear your radio all over the house. Furnished complete with a five-foot (5 ft.) cord.

The RICO LOUD-SPEAKER PHONE will prove a revelation to you, if you have used regulation head receivers for loud-talkers.

We are so convinced that you will be enthusiastic about this phone that we make this

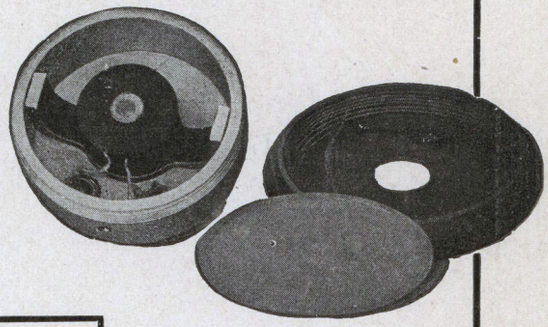
SPECIAL OFFER:

Try this LOUD-SPEAKER PHONE for five days, and simply consider the money you are sending in to us as a deposit. If, at the end of five days, you are not convinced that it is the best loud-talker phone you have ever seen or heard, return it to us and your money will be promptly refunded.

SEND NO MONEY!

Just write us and tell us that you wish one or more of these phones, and we shall rush the order to you at once. Pay your postman the price of the Phone and then test it out at our expense.

Note the new construction. The pull in the center of the diaphragm is where it should be, **in the mathematical center.** The result: Clear and loud tones, NO DISTORTION.



RICO Tripole Head Sets are the fastest selling phones in America

COMFORT: The one thing that has been lacking in former phones. Our pure gum soft rubber headband cover solves this problem. No more ear aches from pressure, as with the old-style band.

RICO Tripole Head Sets are manufactured in types from 5 ohms to 6,000 ohms. RICO Phones will prove a revelation to you. On account of their peculiar construction they do not distort the sound, but render the tones clear and distinct. You do not get a sharp, shrill sound, nor a muffled sound as in some other receivers. The tones are always natural. This is particularly so when used in connection with two or more stages of amplification.

Mail your order at once, if the dealer can not supply you. Insist upon RICO Tripole. There is a very good reason why you should use RICO Phones, and that is they are different—not merely Phones, but

Phones built for Radio

PRICE LIST

Parcel Post—Paid Anywhere in North America

No. 25	Special Loud-Speaker Phone with cord		$4.50		
No. 20	2000 ohms	Double Head Set	6.50		
No. 30	3000 ohms	Double Head Set	7.50		
No. 40	4000 ohms	Double Head Set	9.50		
No. 50	5000 ohms	Double Head Set	12.50		
No. 60	6000 ohms	Double Head Set	15.00		
No. 10	1000 ohms	Single Head Set	4.00		
No. 15	1500 ohms	Single Head Set	$4.50		
No. 75	75 ohms	Double Head Set	6.50		
No. 5	5 ohms	Double Head Set	6.50		
No. 2	1000 ohms	Receiver only	2.50		
No. 3	1500 ohms	Receiver only	3.00		
No. 05	5 ohms	Receiver only	2.50		
No. 075	75 ohms	Receiver only	1.00		

Guaranteed in Every Particular

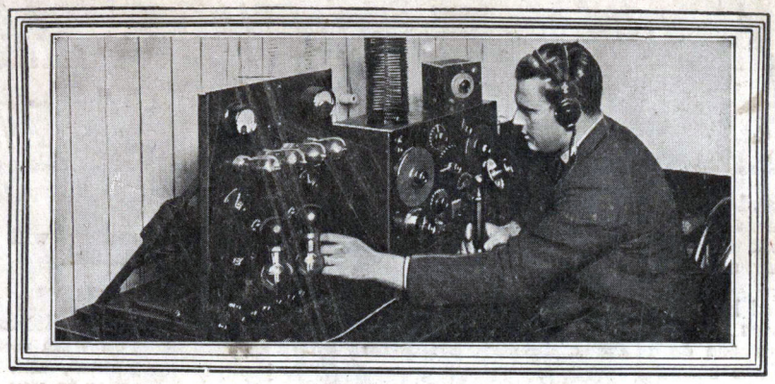
Dealers and Jobbers

Write for our wonderful proposition. Cash in on the fastest growing phone business in the United States.

MANUFACTURED BY

RADIO INDUSTRIES CORPORATION

131 Duane Street, New York City



Become a Radio-trician

Radio-trician means to Radio what
Elec-trician means to Electricity ©

Learn at home the greatest profession of today and the future. Become a master of radio installation, operation, maintenance, repair, mechanics, design, inspection, salesmanship and invention.

THE world is aflame with Radio. Never before in the history of the country has an industry leaped to the forefront as rapidly as this great, new science. Hundreds of thousands of radio receiving sets are in operation—tens of thousands of sending stations will be erected—and this enormous craze is permanent. Even today manufacturers are months behind their orders! Improvements are being made every day which must increase the demand for radio equipment to even *greater* proportions than now.

Men of foresight, men of vision know what this means. Never before has there been such an opportunity. Radio-tricians are needed today everywhere. More and more will be needed as the demand for radio installation, radio operation, radio maintenance, radio repair, radio salesmanship becomes greater and greater.

Wherever you go, there are hundreds of radio sets to be installed—wherever you go, thousands upon thousands of dollars worth of radio equipment is being sold—wherever you go, there are radio sets to repair; and if you seek adventure, there are radio sending stations calling to you from ships and land stations all over the world.

The Pioneer School

The National Radio Institute has a record of over 8,000 students. It is the pioneer school. It teaches every phase of radio from the ground up. It teaches by means of actual practice, actual assembling of a radio outfit, actual operation of radio equipment. It teaches by problem and principle so that National Radio-tricians are in demand everywhere.

Here is a profession which is paying enormous earnings to men all over the country today—a profession that will make hundreds of men wealthy—a profession far more lucrative than that of any other technical or mechanical employment you can secure.

What will you do?

The world is aflame with radio. What are you going to do to "cash in" on the demand for men, for equipment, for experience? Are you going to sit idly by wondering what it is all about, or are you going to make the most of this, the greatest opportunity presented to men of ambition in 50 years?

Write at once for the complete catalog to the National Radio Institute. This is the turning point in your life. Upon your decision *this instant* may depend your entire future. Mail the coupon, or write a letter NOW—*for your own sake!*

NATIONAL RADIO INSTITUTE

Radio Headquarters

Dept. 1261 N. W., Washington, D. C.

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Please send me your catalog "How to Learn Radio at Home" describing your Home Study Course which will qualify me to become a Radio-trician.

Name.....

Address.....City.....State.....

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